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Worldwide Report

NUCLEAR DEVELOPMENT AND PROLIFERATION

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WORLDWIDE REPORT

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TURKEY'S ROLE IN PAKISTAN'S NUCLEAR PROGRAMS

Istanbul CUMHURIYET in Turkish 10 Nov 86 p 7

[Text] Turkey is indispensible for the other U.S. allies in the region, because the occupation of Afghanistan and the Islamic revolution in Iran has caused severe panic in Washington which sees the Islamic countries straddling the southern border of the Soviet Union as a retaining dam against the north.

In 1980, the United States envisaged to extend the Turkey-Iran-Pakistan axis--which is known as the "Islamic protective belt" or the "3d Strategic Region" within the framework of a doctrine that is attributed to President Carter's national security adviser, Zbigniew Brzezinski--to the east by including China in it and thus hoped to put up a first line of defense in the event of a prospective Soviet sickle operation.

Despite their apparent differences, the regimes and leaders of these countries which were pushed together in the 1980's bear an extraordinary resemblance to each other. In particular, the cordial ties between Pakistani President Zia ul-Haq and President Kenan Evren are so advanced that Zia ul-Haq termed Evren as "a source of inspiration" and, in return, Turkey banned the showing of the film "Gandhi." Those who did not know that the banning of "Gandhi" was a gesture of good will by Turkey to Pakistan subsequently wondered "why a film depicting the national liberation struggle of the Indians--who supported Ataturk--was banned."

Small Problem: Uranium

Washington was highly pleased with this relationship except for a small problem: The quest for uranium enrichment technology.

While trying to block this quest, the United States did not want to--in the words of a State Department official--"embarrass" the leaders of its two most reliable allies in the region, Zia ul-Haq and Evren, by doing it openly.

However, a crack developed in this balance in June 1981.

As the U.S. Senate Foreign Relations Committee deliberated on the issue of military aid to Pakistan, the administration was forced to acknowledge under insistent questioning by senators that "they were aware that a cargoload of strategic materiel was shipped to Pakistan in ships flying the Turkish flag."

Because the United States views Pakistan within the framework of a strategic consensus against the Soviet Union, it felt the need to stop Turkey from undertaking such a venture in order not to jeopardize the $3-billion aid to Pakistan. This was necessary because Congress could oppose "economic and military aid to a military dictatorship like Pakistan which had ambitions to build an atomic bomb."

The U.S. State Department thus explained this predicament to its ambassador in Turkey, Robert Strausz-Hupe, and asked him to try to dissuade Turkey, a NATO ally, from such a venture.

At the time, the ambassador discussed the matter with then Foreign Minister Ilter Turkmen and then contacted the military.

In his discussions with Turkish authorities, Strausz-Hupe argued as follows:

"If Turkey insists on its current stance, it will jeopardize defense aid to Pakistan; a militarily strong Pakistan is as desirable for Turkey as it is for the United States."

We learned the developments preceding these events from nuclear expert Charles Von Doren with whom we talked at the NATO headquarters in Brussels in April 1986.

Nuclear Raw Materials from Europe to Pakistan

Although Von Doren had no intention of giving more than a sentence of information about the nuclear status of the countries in the region, when he said that "India had many complaints in the past about Turkey and Pakistan," we began to persist:

"Were those complaints about collaboration between Turkey and Pakistan over nuclear research?"

"Yes, there have been such charges."

"Were you able to find any solid evidence in that regard?"

"We had some clues that there was technical cooperation between the two countries in 1982."

"Is Turkey so advanced as to be able to help Pakistan on this issue?"

"I do not think so. Turkey has research reactors but it does not have uranium enrichment facilities. We know that Turkey has nuclear specialists, but I do not think that Turkey needs such a weapon."

"If Turkey is not helping Pakistan, then Pakistan is helping Turkey."

Von Doren responded with a big laugh and said:

"It seems that you are out to fish."

We persisted:

"Have you asked for any explanations from Turkey on this issue?"

"I do not recall, but we know that assistance was requested from technicians of certain Swiss and German firms and that some raw materials were shipped from Germany to Pakistan. We also know that they obtained some components from Holland. As soon as we became aware of these facts we indicated our reaction to Pakistan. I think that following our reaction Pakistan was forced to approach Turkey."

"You mean, Pakistan approached Turkey so that Turkey would buy materials from Europe on behalf of Pakistan? That is for re-export [to Pakistan]?

"Yes. At that point we sounded alarm bells and brought the whole affair to a halt. However, what was significant was not so much Turkey's re-export venture to Pakistan but how determined Pakistan was to obtain this weapon at any cost."

"How did Pakistan approach Turkey?"

According to information given by the American side, when NATO blocked Pakistan's uranium enrichment program aimed at building an atomic bomb, Zia ul-Haq opened talks at the highest level with Turkey and stated that "they had reached the final stage in the project" but that "they were having problems in getting certain crucial raw materials."

Evren Enters Stage

At that stage, it was noted that Turkey's NATO membership would be useful in obtaining materials Pakistan could not buy from Europe and it was decided to implement this plan.

Of course, in the course of these talks, while never officially negotiated, it was implied that Pakistan would "proudly share with brotherly Turkey" the nuclear knowhow it would acquire with Turkey's help.

Because the Turkish leadership viewed this collaboration within the framework of sovereignty rights of two sovereign states, the assistance to Pakistan began to be run completely at the initiative of President Kenan Evren.

However, the West's reaction was predicated by an interesting development that occurred in the same week as the leaders of the two countries began to discuss the issue privately. A report about the talks leaked to international platforms through a source in Athens.

Finally, Greek Prime Minister Papandreou told then U.S. Secretary of State Haig about Turkey's work on an atomic bomb. He told an astonished Haig about the meeting between Zia ul-Haq and Evren and quoted verbatim the phrases used in the conversation.

Turkey's work was difficult; on one side there was Washington and on the other side there was Islamabad.

In the end, Washington won.

9588
CSO: 5100/2419

TUNNEL MAY TEST FOR LEAKS FROM DAYA BAY PLANT

Hong Kong SOUTH CHINA MORNING POST in English 26 Jan 86 p 3

[Article by Peter Robinson]

[Excerpt]

THE effe of leaks from the proposed Daya Bay nuclear reactor and pollution from factories here are to be tested in a wind tunnel under construction at Hongkong University.

Dr Kot Sau-chun of the Department of Mechanical Engineering has designed the wind tunnel with the support of a university grant for strategic research. The initial main reason for its construction was to test the effects of industrial gases on the air and their dispersal.

However groups concerned in the Daya Bay project are keen to use it test the effect of nuclear leaks on Hongkong under different conditions.

The tunnel costing $300,000 will have a large fan providing wind effects. Models of various sections of Hongkong will be built.

In the case of Daya Bay, Dr Kot said, "We can pump in tester gases and measure their concentration. The effect here of any nuclear leakage depends on the amount leaked and wind directions. If the leakage was small it might not be a big problem. But if there was an unfortunate wind from the northeast and a serious leakage you can foresee problems."

He said that the temperature of the released material was also important. "The city of Kiev is near Chernobyl but did not suffer that much radiation compared with places further away. This is due to the buoyancy of the leak, for the hotter the discharge the higher up in the air it is pushed and carried further away. So places close to a reactor can suffer less radiation."

A lot of this sort of atmospheric testing has been carried out by field tests and computer simulation. However, Dr Kot said "Computer modelling is only really good for flat terrain and cannot provide all the detail, for which you need laboratory conditions.

"The best thing is to control the pollutants at source. But as the case of Hongkong industry which specialises in export orientated consumer goods most firms are too small to provide the proper equipment or are in high rise blocks and are unable to build tall chimneys. Larger concerns such as power plants are able to do this.

"Up until now not many people have paid attention to pollution and have relied on dilution in the atmosphere. But now we have the Environmental Protection into Department monitoring this."

The theory that pollutants can be diluted by dispersal in the air worked in some cases but the mushrooming of high rise blocks had meant that the polluted air could be trapped in what Mr Kot calls "street canyons."

He said, "Even in New York where you have much higher rise buildings the problem is not so great since streets are much wider and there is more air dispersal. Hongkong is quite unique."

The territory had sufficient high winds for good air dispersal in more open areas but pollution tended to be localised in trapped areas such as Kwun Tong.

The results from the wind tunnel tests should start appearing in about a year's time and assist in better "building management" to control this problem.

/9317
CSO: 5150/0079

SOVIET MISSION STUDIES RADIATION TREATMENT AT INSTITUTE

Help With Chernobyl Victims Appreciated

OW141243 Tokyo KYODO in English 1120 GMT 14 Jan 87

[Text] Hiroshima, Jan. 14 KYODO -- The leader of a mission of four Soviet professors, visiting Hiroshima to study radiation treatment, Wednesday praised a medical program devised by Japanese specialists for victims of the April 1986 Chernobyl nuclear power plant disaster. Andrey Vorobyev, a professor of medical technology research associated with the Public Health Ministry, told members of the radiation effects research institute that the study will be valuable in improving bilateral cooperation concerning treatment of radiation victims. The Japanese medical team advised Soviet officials to conduct an immediate medical survey on the 135,000 residents of the Chernobyl area, near Kiev in the Soviet Ukraine. Team members said it should be followed by biannual checks to record the progress of leukemia and other radiation-related disease. The experts at the Japanese institute, which is regarded as an international authority on radiation studies, also called for the monitoring of dietary habits and changes of address of radiation victims, as well as conducting radiation count checks on tooth samples and on the exteriors of their homes.

The Soviet delegation showed great interest in the research work of the institute, based on data collected from victims of the atomic bombs dropped on Hiroshima and Nagasaki in World War II. They also said they have already begun to collect individual data on Chernobyl-area residents to be fed into computers for future analysis, in line with the proposals by the institute.

Mission Visits Hiroshima Institute

OW130347 Tokyo KYODO in English 0322 GMT 13 Jan 87

[Text] Hiroshima, Jan. 13 KYODO -- The leader of a Soviet Government mission thanked Japan Tuesday for offering assistance in treating victims of the Chernobyl nuclear power plant accident which occurred in April last year.

Andrey Ivanovich Vorobyev, head of the five-member Soviet mission to study Japanese treatment of radiation victims, met with Japanese officials at the Radiation Effects Research Institute here.

He said various countries have offered assistance since the Chernobyl nuclear power plant accident, and Soviet physicians have made use of the Japanese experience when they dealt with transplants of bone marrows. He added that he was grateful for the help that had been given.

Tetsuhiko Yoshida, director of the Sanitation Bureau of the Hiroshima city government, said the city was ready to offer whatever information it had on the treatment of the victims of the atomic bombing of Hiroshima and Nagasaki in 1945 and on the results of research on radiation effects. He expressed the hope that the information could be useful to Soviet physicians treating the victims of the nuclear power plant accident.

The Soviet mission arrived in Tokyo last Sunday and will remain in Japan until January 21.

/9738
CSO: 5160/023

DAILY DISCUSSES COMPREHENSIVE TEST BAN

Toronto THE GLOBE AND MAIL in English 5 Feb 87 p A6

[Text]

While the seventh round of the superpower arms talks churns on at Geneva, the United States has made its own loud statement on nuclear disarmament beneath the Nevada desert.

The first U.S. nuclear weapons test of 1987 was conducted on Tuesday — a day earlier than previously announced — in an apparent bid to pre-empt anti-nuclear protesters who hoped to obstruct the test. The diplomatic fallout from the blast was soon perceptible in Moscow, where state-run Soviet media hinted that the Kremlin is likely to end its 18-month-old unilateral test moratorium.

The Russians warned last December that a further explosion at Yucca Flat in Nevada would provoke the renewal of detonations at Semipalatinsk in Kazakhstan. The U.S. has carried out 20 announced nuclear tests — and, according to the Soviets, five unannounced ones — since Soviet leader Mikhail Gorbachev first declared his one-sided total test ban.

The Soviet initiative offered one of two potential benefits to its sponsors. If accepted by the U.S., the test ban would hamper America's development of ballistic missile defence, since an X-ray laser powered by a nuclear explosion is a key technology in the "Star Wars" program. If spurned by the U.S., the test ban would show the Soviet Union to be the superpower dedicated to disarmament.

Given President Ronald Reagan's commitment to the untrammeled development of "Star Wars," Mr. Gorbachev has thus far had to settle for the propaganda benefit rather than the military one. That is not only the Soviet Union's loss but the world's. For a comprehensive nuclear test ban, particularly in the context of a space weapons accord and cuts in offensive nuclear weapons, would be a laudable and readily verifiable arms control measure.

The Democratic caucus of the U.S. House of Representatives made more than a partisan point when, in a resolution passed yesterday, it urged Mr. Reagan to stop further tests and "begin immediate negotiations with the Soviet Union to achieve a reciprocal, simultaneous and verifiable ban."

While the resolution called on House committees to withhold funds for further U.S. nuclear tests of more than one kiloton, it is unlikely that Congress will tether the Reagan Administration in this manner. But it could ratify two treaties, signed in the 1970s, that would limit the yield of underground nuclear tests to 150 kilotons.

Both superpowers should recall the ephemeral accord they achieved on the test ban issue at the Reykjavik summit, where Messrs. Reagan and Gorbachev agreed to seek a gradual reduction rather than an instant ban. Step-by-step progress remains desirable and, despite the overall deadlock at Reykjavik, possible. Way-stations en route to a comprehensive test ban could include a quota testing agreement — which would reduce the number of tests — and a lower threshold treaty — which would reduce the yield of underground tests to less than 150 kilotons.

Such advances should be facilitated by Moscow's more receptive attitude toward test ban verification. The traditional Soviet resistance to on-site inspection of arms control compliance has been modified. A team of U.S. and Soviet scientists last year was allowed to set up monitoring devices around the Semipalatinsk test site.

But for a comprehensive test ban treaty, or perhaps any other major arms control treaty, to be a realistic prospect, the U.S. Administration will have to curb its "Star Wars" ambitions. That's why Pentagon proposals this week to accelerate the program were a worrisome counterpoint to the blast in Nevada.

VETERANS GROUP URGES NUCLEAR CAUTION

Toronto THE GLOBE AND MAIL in English 3 Feb 87 p A4

[Text]

OTTAWA

Canada should drop commitments to NATO and the North American Aerospace Defence Command to the bottom of its priorities, says a group of retired military officers. Veterans Against Nuclear Arms told reporters that Canada, by participating in the NATO and NORAD alliances, is supporting a confrontation between the superpowers that becomes more dangerous every day. Ray Creery, a retired naval captain, said Canada should put more emphasis on peacekeeping through the United Nations, declare itself a nuclear-free zone and press NATO to guarantee that the alliance will not be the first to use atomic weapons.

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CSO: 5220/29

PROGRESS, DELAYS IN CONSTRUCTION OF NUCLEAR PLANTS OUTLINED

Kozloduy Construction Accomplishments

Sofia IKONOMICHESKI ZHIVOT in Bulgarian 29 Oct 86 p 5

[Article by IKONOMICHESKI ZHIVOT Correspondent Nevena Markova, Kozloduy]

[Text] High quality construction and installation work, higher labor productivity, reduction of material outlays and efficient use of scientific and technical accomplishments are merely part of the tasks successfully implemented by the leadership of the Plant Building SU in Kozloduy. In the first 9 months of the year the plan for construction and installation work was fulfilled 125 percent; overall profits reached 112 percent; social labor productivity reached 106 percent. Planned savings from new technologies were exceeded by 42 percent. The collective achieved a number of labor successes, including the following:

Completion of the sealed part of the reactor section of block No 5 in 21 months only. In this case the brigades headed by Heroes of Socialist Labor Ivan Lichev and Dimitur Petrov and order-bearers Nikola Manasiev, Manol Manolov and Yordan Mikhaylov distinguished themselves;

The installation of a large-sized block weighing 300 tons was completed for the first time in our country; the main slab of the turbine foundation in the machine hall of power block No 6 was cast in concrete in only 6 days. More than 5,000 cubic meters of concrete were poured by the labor collectives headed by Zlatko Stoyanov, Nedko Geshev and Vasil Vasilev;

Last year 11 one-of-a-kind construction and installation operations and a number of new technological systems were applied. The production of seven new types of items yielding high economic results was mastered.

The building of the second 1,000 megawatt reactor in our country—the sixth power turbine—is progressing much faster compared to the fifth. Elevation 13.20--the most difficult to attain--was reached in less than 2 months, compared with 6 months for the fifth power block.

"Speaking of record-setting accomplishments, they are most clearly manifested in building the reactor department of power unit No 6," enterprise director

Eng Todor Topalski said. "From elevation 6.60 in April we reached elevation 28.30 in October. This was 2 months ahead of schedule. The brigades headed by Marin Popov, Licho Kirilov, Goran Goranov, Aleksandur Zamfirov and others proved their great possibilities."

New methods are being applied for all finishing operations in the reactor section of power unit No 6. At power unit No 5 the process involved a great deal of manual labor and loss of time. Today such activities are taking place along with the basic construction operations, making maximal use of the open front method.

"The experience gained in the building of block No 5 is the base of what we are accomplishing with power block No 6," said Eng Oved Tadzher, representative of the Council of Ministers Bureau and chief of the nuclear power plant construction project. "We are using more powerful equipment deployed in a more efficient manner. We are making greater use of prefabricated large-block assembly units. We have created a real possibility for undertaking the concrete lining only 24 hours after the elements have been assembled. The assembly area in front of the reactor department provided an efficient solution based on practical experience. We are applying a new method in pouring the concrete with the help of high efficiency concrete pumps with tower distribution systems."

The building of the fifth and sixth power blocks at the Kozloduy Nuclear Power Plant is an example of the higher level of organization of the work, discipline and responsibility. The collectives working on the basic operations, the concrete center and the other auxiliary activities are working on a 7-day three-shift system. However, the work of the management and the entire collective of the Plant Building SU in Kozloduy is not characterized by satisfaction with accomplishments but by the desire to reach further improved labor results. Total mobilization of the forces for the sake of the final objective--the commissioning of the 1,000 megawatt reactors--was the result of the successful accountability and election conferences of the self-governing authorities.

Nuclear Power Servicing

Sofia RABOTNICHESKO DELO in Bulgarian 3 Nov 86 p 4

[Text] Vratsa, 2 November (RABOTNICHESKO DELO correspondent). Within a short time the specialized Atomenergoremont Specialized Enterprise in Kozloduy has developed as a center for the production of spare parts for the manufacturing of complex systems and installations. It is producing a wide array of items for the nuclear power plant and the power industry.

The enterprise is engaged in the production of more than 2,000 different parts to which several new major developments are now added. The enterprise will manufacture a container for checking on VNR-440-type reactors, as well as a ball-cleaning system, a container for the transportation of the spent fuel, remote-control valves in a radiation environment and others.

Belene Nuclear Plant Construction

Sofia RABOTNICHESKO DELO in Bulgarian 13 Oct 86 p 1

[Text] Pleven, 12 October (RABOTNICHESKO DELO correspondent). The foundations for the construction of the first reactor at the Belene Nuclear Power Plant are being laid under the direct supervision and control of specialists. Following the completion of the large ballast cushion and the prestressed concrete, the cement lining was completed by the brigade headed by Ivan Filev.

Work possibilities have been provided for laying the hydroinsulation layer of the main foundation. All technological processes are taking place within the stipulated parameters and a very good rating has been given to the quality of the work.

Construction Difficulties at Belene

Sofia TRUDOVO DELO in Bulgarian 17 Oct 86 pp 1-2

[Article Lt Col Stoyan Tsenov, TRUDOVO DELO correspondent]

[Text] The view from the Belene Nuclear Power Plant is impressive. Dozens of construction and installation organizations have been deployed on the huge area near the Danube River. Some are pouring sand sucked out of the bottom of the river with the help of powerful equipment. Others are laying roads and digging the foundations of the 1,000 megawatt reactor; others, such as the construction troops of the unit in which Officer Angel Draganovski is serving, have built the first warehouses of the power plant and are now hurrying to complete the concrete mixing areas in front of them....

The beginning was quite difficult. It was still winter when the soldiers came.

"At that time," Officer Peyo Stoyanov recalls, "we were wondering where to start. We had to lay a base and, at the same time, fulfill the plan...."

The balance is good. In less than 8 months construction and installation work worth several million leva was completed and the initial projects were finished and rated excellent. The troops are housed in comfortable temporary barracks. However, a great deal of construction and installation work remains to be done (by the end of the first 9 months the implementation of the plan had fallen behind by nearly 600,000 leva).

We have now entered an area of difficulties which have not spared the military collective in the least; some of them are still hindering the normal construction rhythm.

Let us consider concrete deliveries. The average daily request of the subunits range from 120 to 140 cubic meters of concrete whereas no more than 70 to 80 cubic meters arrive at the projects, this being the maximal output of the concrete manufacturing center.

The balance is always a problem and usually comes from neighboring concrete manufacturing centers, providing that they have available surplus capacities.

That is why the soldiers at the warehouse base and the first shifts spent hours waiting by the casings for the concrete to arrive.

"The situation will not change until the plan for concrete is completed," said Officer Valentin Elenkov with concern.

But what until then? How many more deadlines will be missed?

Strange though it might seem, the chief performer failed to plan at the proper time for the procurement of quarry materials, as a result of which the unit is forced to rely on its own small concrete production capacities as well as on concrete manufacturing centers which are willing to help it.

Other difficulties are developing as well. In order to remove the dirt dug out in building the barracks, 24 trucks were needed for October; the unit, however, has only 17, and only 6 of them can work on sandy soil.

What is the solution? The unit in which Officer Ivan Sevdanski serves should review once again its truck fleet and ensure the implementation of the construction program.

Subjective reasons are influencing discipline and order at the construction sites and the conservation of construction materials. The command and the party organization are well aware of these problems.

As to the other difficulties which cannot be solved by the construction troops, they should be settled as soon as possible by the main performer, the investor and the other organizations and departments interested in preventing any delays in the construction of the second nuclear power giant for the homeland.

Progress at Belene Construction

Sofia OTECHESTVEN FRONT in Bulgarian 27 Nov 86 p 1

[Article by Special Correspondent Radost Pateva]

[Text] The construction site is the current project which, as we know, will determine the aspect of Bulgaria's power industry at the start of the next century. A team of editors has visited Belene three times. The changes over the past year are obvious: the site is crisscrossed by the buildings of the newly erected installations. A protective system consisting of (repanol) and concrete has been laid under the future reactor No 1, which precedes the foundation layer. The same type of operations has been undertaken at the site of the second foundation.

Looked closely, the preparation of the foundations for the second reactor is a ditch which rapidly fills up with water. The antifiltration "screens" and water reduction systems have not been completed yet, due to shortage of

equipment. The filling of the flood area has fallen behind by about 3 million cubic meters. In terms of time this means that the construction, which cannot be undertaken before the supporting clay soils have settled under the weight of the ballast stratum will be delayed significantly (otherwise the installations built on top may lose their shape). Here again the reason is the lack of suitable equipment.

Nevertheless, the greater trouble is the lack of designs for the overall solution of the building of the area with all the necessary engineering facilities and temporary and permanent construction. For that reason the planning of the necessary specifications for materials is being guessed at and in frequent cases work has had to be stopped because of the impossibility of procuring 5 or 10 tons of specific type of metal of suitable dimensions. The prospects for the next year are equally not encouraging. If the blueprints (as was promised) are received before the end of December, the materials, in terms of quantity and variety, must have to be requested before 30 June. This means that unless the construction workers postpone their 1987 work for 1988, they would have to procure the necessary materials at their own risk.

Large construction projects are frequently compared to beehives, some of which are active whereas in others the bees are filling the honeycombs. The main performer in the construction of the Belene Nuclear Power Plant--the Energostroymontazh Enterprise--shows another similarity with a tireless family of bees: last year it split three times. In order to develop the work areas of the Pleven SMK and the Installations Unit in Belene, and the hydroenergetic complex, skilled workers were withdrawn from Energostroymontazh, together with managers, equipment, minor mechanization facilities, instruments, trailers, and others. This division is unhealthy in terms of the basic enterprise which, as in the past, is required to implement its plan.

"Our main purpose is to develop a united collective and concentrate not simply the personnel but to have intelligent workers and highly skilled specialists," we were told by Eng Kharalampi Kharalanov, who was appointed general director of the Energostroymontazh Enterprise 3 months ago. "In the future the Belene Nuclear Power Plant will be one of the largest Bulgarian projects, for which reason despite the difficulties the requirements we are facing are extremely strict. A construction aimed at the 21st century cannot be completed with obsolete methods which we are forced to use, or else make errors which have long had to be eliminated. Let me indicate as an example that we have undertaken work for the second reactor in order to make better use of the equipment and abandon projects in order to prevent the first reactor to be built while, next to it, start digging the foundations for the second. This is an abandoned practical method. I came here from Kozloduy for this purpose, for which reason I believe that our task should be to build a bridge between Kozloduy and Belene, both literally and metaphorically. The river enables us to use some of the procurement facilities of Kozloduy where semifinished items, structures and large parts can be manufactured for us. This will greatly facilitate construction in Belene, for our only concern will be to organize the transportation of the items.

"We have other ideas as well: taking the example of Balakovo in the USSR, to organize a so-called open block installation, i.e., to deliver to the reactor

department 'prepacked' items, within which the equipment has already been assembled. This will enable us to use installation areas which are more distant (they do not have to be in the vicinity of the project itself); this will allow many more installation crews to work and, in the final acco 't, to shorten construction deadlines. We are seeking new and modern meth ds to organize the construction project: all units within the enterprise operate on their own cost accounting basis. We would also like to apply the brigade piece-rate method. The contract with the primary labor collective is very useful to the enterprise management. However, how could we conclude such a contract without having blueprints and without being confident that the materials needed for the work of the brigades will be procured...."

In addition to blueprints and equipment, in order to serve the current problems existing in the construction of the Belene Nuclear Power Plant, we must also ensure the unrestricted supply of necessary materials and create conditions for the recruitment of the necessary cadres. Housing and kindergartens must be built. We must increase the number of stores and the variety of items they provide. We must also find a solution to the problem of organizing the leisure time, such as building sports facilities and areas for recreation and cultural entertainment. In terms of the project this may be considered secondary. However, in terms of the people who have come to work here this is a vital necessity. Meanwhile, we are short of personnel, not only in terms of number but in terms of individuals who can build in accordance with the requirements of the 21st century. Even the general director must replace two of his deputies. Where can we find suitable people? Naturally, somewhere in Bulgaria, for it is here that the people who will build the Bulgaria of the 21st century are working and studying.

5003
CSO: 5100/3003

ZAGREB INSTITUTE, SARAJEVO FIRM COOPERATE ON NUCLEAR TECHNOLOGY

Zagreb DANAS in Serbo-Croatian 2 Dec 86 pp 17-18

[Article by Ratko Boskovic: "Rudjer Involved in Poaching Plutonium"]

[Text] An impenetrable veil of secrecy envelops the project of the "Rudjer Boskovic" Institute in Zagreb and "Energoinvest" of Sarajevo. At the very edge of the institute's complex a laboratory is being built about whose purpose there has been speculation, and that not only among laymen: Why have we undertaken to develop the technology for processing radioactive waste?

A current of unrest which very quickly reached newspapermen as well fled through the "Rudjer Boskovic" Institute, a scientific institution in Zagreb. It was then that a meeting was held of the institute's scientific council where for the first time there was public and collective discussion of a question which has intrigued the scientific researchers and personnel of the IRB ["Rudjer Boskovic" Institute], divided into 11 separate OOUR's, for a long time now: What will be the purpose of the large concrete building that has sprung up already to the level of the second story at the very edge of the IRB complex, which is said to be intended for "processing radioactive waste"?

It seems that there were some heavy words uttered at that meeting of the scientific council and a fierce discussion developed concerning very sensitive matters. For a newspaperman who did not know of the meeting in advance it was very difficult to pick out the truth among the rumors after the event. Since the minutes--which are public, like all the other documents of the IRB--were kept by the ordinary taking of notes, they were inaccessible for a time because they had not been verified. When, we assume, they were verified, then additions were made, and then there was another wait for the additions to be verified. Aside from that, even those workers at IRB who presented their opinion openly and fiercely both in the meeting and to the newspapermen did not want that opinion to be published, nor were they willing to say anything officially, in their official capacity.

Rumors to the effect that Rudjer, under a contract with "Energoinvest" of Sarajevo with a face value of 100 billion old dinars, was preparing to equip a "multipurpose building like a bunker" with a "storage facility for tens of tons of nitric acid (in the middle of the city)" for the "processing of radioactive waste" became mixed with the already deep divisions among the 11 diverse

OOUR's created by who knows what kinds of conflicts of interest in the past and accentuated by the present extreme differences in level of income (and thereby in the level of personal incomes as well), by the opportunities for solving housing problems, by the conditions for advanced professional training and the like, and since "radioactive waste" usually includes spent nuclear fuel, and its processing (referred to as reprocessing) makes sense only to extract uranium and plutonium from it, the speculations in public (especially that portion of the public which is not specialized) took on the dimensions of an atomic bomb.

Since the building referred to is being built by the IRB OOUR "Technology, Nuclear Energy, and Protection," we turned for an explanation to the OOUR's director Dr Radoslav Despotovic, who had in fact signed the contract with "Energoinvest," a contract which allegedly no one has seen except for him and the director of the IRB. It soon became clear in the meeting with Despotovic that some of the misunderstandings about the building he is constructing have their origin in his own particular character. It was very difficult to catch him near his telephone, since usually he is either away on business or tramping through the mud around his construction site with blueprints in his hand, together with the designers and the contractors. When we did make contact, the first thing the newspaperman was warned of was absolutely not to be hasty in anything, "since...," and then--which in newspaper practice has never, absolutely never, happened in contact with scientific institutions--to submit an official request and justification as to what he wished to write about. At that time we learned that the contract with "Energoinvest" cannot be seen, since it is a business secret. In answer to a question put over the telephone, we received the same answer from "Energoinvest's" Institute for Heat Engineering and Nuclear Energy, along with the offer that they would also present their story to the newspaperman. The customary procedure of first letting the newspaperman examine the documents and then telling him which details are secret was not in effect in this case.

On a Hill Above Zagreb

And the story of Dr Radoslav Despotovic goes like this: "We have work to do on a task which is very important, since elimination of any waste (in this case, nuclear--author's note) is a very responsible and urgent obligation. We have been engaged on such tasks and jobs for 30 years now, back since the time of the Federal Nuclear Energy Commission, and our researchers were involved in all the phases of construction of our first nuclear power plant...."

"It is quite natural," Dr Despotovic said, "that there also should be cooperation concerning the technologies which we have developed here with the largest exporter of nuclear equipment in Yugoslavia, 'Energoinvest,' which has large and I would actually say quite normal ambitions to bring its present program up-to-date with all those technologies which must accompany nuclear power plants, and then there is also the question of working out the processing and the compacting technology and the storage technology and also the technology for building various models of the strategy for storing the radioactive waste which has been technologically dealt with."

In the current Yugoslav divisions into adherents and opponents of the program for construction of nuclear power plants Dr Despotovic, for obvious reasons, is considered a reliable adherent even at "Rudjer Boskovic." What is more, he is also a member of the rather small group of people who are now evaluating the bids submitted in the competition to build the NE [nuclear power plant] Prevlaka and the series of nuclear power plants. This fact itself is sufficient to arouse the animosity of the convinced opponents of the nuclear program. But in addition, Dr Despotovic has one characteristic which among scientists is usually a negative one: he is a very able businessman. At a time when certain OOUR's of "Rudjer Boskovic" have been unable for years to purchase even professional journals, Dr Despotovic's OOUR has "...learned to work on that basic research which is directed toward and closest to the needs of our economy...."

"Through that job," Dr Despotovic says, "at a time which is very difficult for our scientific community, we have had a relatively good economic status...and have been able to buy relatively expensive equipment which we were able to obtain from programs in which we cooperated with respective economies.... This is how we came to be involved with a very powerful partner like 'Energoinvest' on this task of what we call solving the technology for radioactive waste. This is a program whereby in a certain number of years we will be working in a directed way on that research which will also provide the basis for designing a larger system on which the processing of radioactive waste arrived at by our research work is to be verified."

Does the research also cover the processing of spent fuel (the hot and radioactive fuel which is removed from the reactor), what is referred to as reprocessing? No, nothing of the kind, says Dr Despotovic; fuel processing is something altogether different. What Despotovic's laboratory is concerned with is investigating the possibility of cleaning the waste which is created in the operation of the power reactor (and indeed of all types of waste which occur in the work with radioactive materials) of radioactive particles and to do so with a technology which the laboratory has been dealing with for many years now. It involves the use of what are called molecular sieves, sodium-aluminum-silicate powder or zeolite, a material which contains tiny channels of a certain diameter so that the radioactive particles can be captured in those little channels and then the material "baked" into something similar to porcelain and then stored in a dump. The point, Dr Despotovic says, is that the "porcelain" obtained in this way is better for storing radioactive waste than, say, glass, which is used in other countries, and the procedure is also simpler and safer.

All of this sounds so simple that one must put the question--Why, then, so much secrecy? Why is this program "confidential"? "When a large scientific project is being cofinanced, the one who is doing the financing wants to be the first if not the only one who will use those results. The one who is financing also wants to sell it, and it is therefore understandable that he should conceal the details...."

Since the research will be taking place in a settlement on a hill above Zagreb in the immediate vicinity of the site where the new School of Natural Sciences

and Mathematics will soon go under construction, will it bring a danger of radioactive and toxic substances? Dr Despotovic resolutely rejects such a possibility. "We will be working with what is called a zeolite matrix, this will be exclusively laboratory research, we will not be processing any real waste. In addition, on a computer model we will be "simulating" the behavior of radioactive elements that are created in the operation of a nuclear reactor with nonradioactive elements, and in monitoring the changes which occur in the material over time because of the effect of radiation, we will be using a source of radiation (a so-called cobalt bomb) which already exists at the Rudjer Institute, and the only radioactivity will be at laboratory levels, far below even what is used, for example, in medical diagnosis."

Are Foreigners Also Involved in the Financing?

If only a newspaperman had at least the minimum opportunity to check Dr Radoslav Despotovic's words, which incidentally he would be required to do by the usual standards of journalism! If at least other scientists, those who have been concerned with nuclear problems for years at a distance no more than 100 meters from Dr Despotovic's laboratory, were to take his words without any very great reservations! But they have been putting several questions which Dr Despotovic certainly does not get into in his answers: Why or for whom is "Energoinvest" developing the technology for processing radioactive waste at all when Yugoslavia will not need it for at least another 20 years? Isn't it a question of training personnel and preparing knowledge, equipment, and pilot technology for more ambitious undertakings than trapping radioactive ions with molecular sieves in a pipe around a nuclear reactor? If it is, to meet whose needs? These questions are alluding to the countries of eastern Europe and the Soviet Union to which "Energoinvest" exclusively exports components of nuclear installations, but it is difficult to imagine that those countries would have commissioned "Energoinvest" in Yugoslavia to undertake such a sensitive development, and certainly the advanced Western countries would never have done so. That, then, leaves Yugoslavia. However, the entering into the "building of various models of a strategy for dealing with nuclear waste," as Dr Despotovic euphemistically and diplomatically refers to it, in and of itself touches upon Yugoslavia's very sensitive position in a world in which there is an ever greater danger of the spread of nuclear substances and technologies outside the channels which come under the usual international public surveillance, since even the "technology of the zeolite matrix" is one of the infrastructural technologies of any work with radioactive materials. Further, can the deep anxiety of the other scientists at Rudjer be interpreted only in terms of their envy of a bit more money and presumably better scientific results obtained by one of the laboratories?

Then there is also the question of the amount invested, which is making many scientists dizzy: supposedly 100 billion (the precise amount is a secret), they say, which is almost equal to the sum of all the other investments if one does not count the "special" (that is, military) programs during a year of "Rudjer Boskovic's" pooling of labor and capital with the Yugoslav economy. For that reason alone, says Dr Boran Leontic of the Physics Institute of Zagreb University, it is naive to suppose that Dr Despotovic's contract with "Energoinvest" is perhaps only yet another of the customary scientific verifications or a cover for certain altogether different business deals.

In any case, money is being invested at "Rudjer Boskovic" on a "confidential task" through the nuclear program such as solid-state physics, for example, which gave rise to the entire semiconductor, electronic, and informatics industry (which Yugoslavia so dearly longs for) could only dream of, and that fact fits perfectly into the scenario of deep secrecy, for example, concerning the results of the measurements of the Chernobyl pollution, evaluation of the bids for NE Prevlaka, negotiations to purchase licenses for the fuel cycle, contacts with competitors for building the series of nuclear power plants, the secrecy about choosing the site for storing the nuclear waste.... In terms of the magnitude of that confidentiality, says Dr Marko Branica, we have gone back to the time of the Federal Nuclear Energy Commission. Once again everything is a secret.

A secret from whom, Dr Leontic asks in amazement?! Why does Rudjer need yet another "closed plant"? The processing of radioactive waste and indeed the processing of "spent" fuel, is no secret anywhere in the world. Dr Leontic recalls his visit and very detailed inspection (although he was a foreigner!) of a radioactive waste disposal site in France or of complete fuel reprocessing plants in West Germany. There are hardly any secret among fellow scientists...and a third "closed plant" at Rudjer would go beyond all measure, Dr Leontic says, and I simply do not believe in that kind of scientific work which is aside from everything else financed with public money, if not money of foreign origin, and it amounts to opportunism in the extreme to take that money.

The urgent question is whether we will continue to allow closed plants to be created, institutions within institutions, since in the end it makes no difference at all what people will be doing in them if they can do as they like and no one can monitor them, Dr Leontic says bitterly, and he is not alone in his bitterness.

Certain other scientists have in the end made a serious decision to take up the question of whether they will remain at the "Rudjer Boskovic" Institute at all. Nevertheless, before that they have sought the support of their own self-management bodies. They hope that in the reorganization of the IRB which is under way that might bring better conditions for everyone's scientific work.

7045
CSO: 5100/3006

DANUBE ISLAND CONSIDERED AS POSSIBLE NUCLEAR PLANT SITE

Zagreb VJESNIK in Serbo-Croatian 28 Jan 87 p 6

[Text] The news that research is being conducted on the construction of a nuclear power plant on the territory of Tanja Island in the Danube has caused large protests by the inhabitants of Aljmas, Tenja, and Dalj as well as by residents of Osijek. Nevertheless, Elektroslavonija has not given up the idea of completing this project. The terrain has been carefully examined, and it has been found that with regard to the safety of the location and the impact on the surrounding area, it is possible to build a nuclear plant. Now, according to Engineer Vladimir Tomic, director of Elektroslavonija, everything depends on what position on the construction of new nuclear power plants is taken at the federal level.

Three hundred million dinars have been spent on the current investigations of the islet of Tanja in the Danube. A great deal of field, laboratory, and documentary research has been carried out in the fields of geology, seismology, hydrogeology, hydrology, geomechanics, and meteorology. During the last 7 years experts have come to the conclusion that a nuclear plant can be built at Tanja, because all the investigatory work has been conducted in accordance with the regulations and recommendations of the International Atomic Energy Agency. All the regulations in effect in our country have also been respected. The Tanja site is located on an elevated plateau on the right bank of the Danube, about 4 kilometers upstream from the settlement of Dalj. There is space for the placement of four 1,000-megawatt energy units, and the amount of Danube water available is sufficient for cooling, even when the water level is at its lowest. The proximity of roads, railroad tracks, and the big, navigable waterway make access to the site easy. Experts have ascertained that the Tanja location is an exceptional natural resource that stands out in comparison to 21 other sites on the territory of Croatia.

On the basis of all these findings the competent bodies in the republic have been asked to grant permission and to set the conditions for the preparation of the space during the course of this year. Whether this will happen is still uncertain, especially in view of the protests of the residents of Dalj, Erdut, Tenja, and Osijek, who, should the plant be built, would only be 10 kilometers from it as the crow flies.

/9599
CSO: 5100/3007

SERBIA PLANS NO NUCLEAR POWERPLANTS UNTIL 2000

AU071524 Belgrade BORBA [in Serbo-Croatian 29 Jan 87 p 12

[D.S. report: "No Nuclear Powerplants Until 2000?"]

[Excerpts] Belgrade, 28 Jan--It is believed that detailed analyses in Serbia will show that this republic has no need to construct nuclear powerplants until the year 2000 and that existing sources of power can meet needs until then. However, this does not mean adopting a posture of not constructing nuclear powerplants. For Serbia will not have enough power resources after 2000, and nuclear power is, so far, the only known both economically and technologically proven source of alternative energy. Therefore, it would be best to decide on the possible construction of a nuclear powerplant in 5 to 10 years, it was said at the press conference held today at the Serbian Executive Council, at which Rade Colic, president of the Republican Committee for Energy, Industry, and Construction, and C. Boljanac, director of the work organization for nuclear power production, tried to explain the strategy of the development and utilization of power.

It was also said that a nuclear waste dump is not being built in Serbia nor has there been any mention of building one, because there is no nuclear waste there at all (except for the radioactively low grade waste from research for peaceful purposes at the Vinca Boris Kidric Institute).

By the way, plant tenders have been invited and over 10 of the world's best known producers of nuclear powerplants have applied, from the FRG, France, the United States, Japan, Canada, and elsewhere. It has been decided that, if a decision to build a nuclear powerplant is taken, the same type should be provided throughout the whole country. Equipment only and, possibly, nuclear fuel, should be bought, but everything else would be built in this country only.

/8918
CSO: 5100/3008

CASH CRISIS CAUSES RESIGNATIONS IN NUCLEBRAS

Surrey, England NUCLEAR ENGINEERING INTERNATIONAL in English Jan 87 p 5

[Text] BRAZIL: Financial problems at the state nuclear company Nuclebras continue to threaten the future of Angra 2 and 3 (1245MWe pwrs), despite a promise by the government that they will be finished on schedule. Two directors of Nuclebras have recently resigned as a result of the problems.

During October the government authorized $120 million for Nuclebras to pay its outstanding debts to suppliers and contractors. However, Nuclebras president Licinio Seabra has said that the treasury is releasing far too little cash for the company to maintain construction of Angra 2 and 3 on schedule for completion in 1992 and 1995 respectively. The Angra 2 contractor, Norberto Odebrecht, will have thinned down its workforce from 2000 to 1000 by the end of the year due to shortage of finance. According to company sources, however, Angra 2 could still be completed in 1992 if the government provides an adequate budget for 1987. Work on Angra 3 remains practically at a standstill.

According to Seabra, Nuclebras needs $1000 million during 1987 to maintain its activities: $400 million for further investment and $600 million for debt repayments. But many other industrial sectors are also crying out for the government's limited funds.

Resignations. Early in October Ronaldo Fabricio, director of Nuclebras and head of the engineering design subsidiary Nuclen, resigned citing personal reasons but emphasizing the current problems facing the company: low wages, adverse public opinion and the lack of a clear commitment from the government to the nuclear programme. He has been replaced by Fernando Henning from within Nuclen.

A few days later Nuclebras financial director Hercules Eduardo Dutra also resigned, apparently for similar reasons.

Over 100 of Nuclen's professionally trained staff, about a third, have left in the last two years, while total staff at the heavy engineering subsidiary Nuclep is down by 25 per cent. □

Angra 1 back at last. Angra 1 (657MWe pwr) in Brazil has restarted more than ten months after it shut down for a five month maintenance and refuelling stoppage. Delays have been caused both by technical problems and local environmental groups which, in the wake of Chernobyl, objected to the lack of evacuation plans. The reactor was due back on-stream by June following its first refuelling and maintenance outage, however a local court ruled that it could not operate without better evacuation plans. A series of technical problems has also caused delays.

/13046
CSO: 5100/2068

DETAILS ON NATIONAL NUCLEAR RESEARCH CENTER PLANS

Buenos Aires ENERGIA 2001 in Spanish No 48, Jul-Aug 86 pp 40-42

[Interview with Peru's Cdr Jose A. Pereyra Lopez: "The Peruvian Nuclear Plan: Results of a Close Union"]

[Text] Peru's Nuclear Research Center, which is responsible for activities related to atomic energy in Peru, is working hard to achieve the goals of its Nuclear Plan. In the short term, efforts are concentrating on the Nuclear Research Center itself, which will give Peru the basic infrastructure it will need in order to attain its longer-term objectives. Cdr Jose A. Pereyra Lopez, head of the Buenos Aires Delegation, spoke with ENERGIA 2001, discussing Peru's nuclear progress and the ties existing with Argentine professionals in this field.

Question: It is well known that there are very close relations between Argentina and Peru in the energy sector, particularly in nuclear energy. We would like to know how the Peruvian projects and the activities being carried out on a joint basis are getting along.

Answer: We are working on the basis of our Nuclear Plan which the government approved; it contains short, mid, and long-term goals. One of its basic short-term goals is construction of the Nuclear Center. Speaking in very general terms, this means the creation of the basic infrastructure so that the following goals can be pursued. This basic infrastructure consists essentially of Peru's Nuclear Research Center, which is what we have been working on jointly with Argentina.

Question: What period of time does this plan cover?

Answer: 2005 would be its goal. Of course, a great deal will depend on the feasibility of building a nuclear power plant and connecting it to the electricity network, although that is not our only long-term objective. A nation's nuclear development is not just a matter of using nuclear power to generate electricity. Maturity in the nuclear field is not attained solely by having one or two power plants. There may also be growth in other areas in which

nuclear energy can be applied. But if we are using nuclear power plants as a reference point, that would be the time frame.

As I just said, this is where we are concentrating all our efforts in the short term. We have been working on this project together with Argentina since 1978, based on a contract that was signed in 1977. This is a very special contract; I believe it is the first time a horizontal technology transfer contract was signed. I use the term "horizontal" to indicate that these are two countries with a similar level of development, even though in many respects Argentina does have a significant advantage over us. That contract provides for the construction of this Nuclear Research Center by means of a technology transfer process that includes maximum participation of Peruvian personnel throughout the entire design, construction, fabrication, assembly, and start of operation phases.

For the mid-term goals, we should mention essentially the maximum use of this infrastructure and the development of particular areas and of some very specific applications, for example, in agriculture, industry, and medicine. Initially it was also thought of strongly promoting--and to a large extent with the support of the Argentine government and international organizations this is being done--uranium prospecting in Peru, in order to determine the potential we actually have. In the near future we should probably be able to begin feasibility studies for a first uranium mine in southern Peru. Right now, we do not need uranium. The first plant that will require it will be the 10-MW research reactor and, as this is being used in accordance with a very specific program, we are going to use 20 percent enriched uranium. At that time, it is possible that Argentina may be able to supply it.

Question: At the present time Argentina has enrichment contracts with other countries to provide for its own needs, and it also uses natural uranium. What does Peru plan to do?

Answer: My feeling is that the trend is that even plants that work with natural uranium are going to need a very slight amount of enrichment. And while for very understandable technical reasons a distinction has been made between the development of plants operating with enriched uranium from those using natural uranium, which has created fairly different lines of development, I believe that in the future almost all plants will use uranium that is enriched in varying percentages. For that reason, Peru has not yet made a decision about its power reactors. All this will also depend on our energy demand and on our production of hydroelectric power.

Question: How is Peru's hydroelectric system working? Are its costs competitive?

Answer: Yes. You have to remember that our nation's demand is concentrated along the Pacific coast, while the rivers flow down the eastern slopes,

toward the Amazon. This has made the design and construction of these plants expensive. But so far, even though I am not a specialist in hydroelectric power, I do know that the costs are competitive, and that the nation's potential is underutilized. We still have a large margin untapped. At the present time there are many projects for minipower plants all over Peru, for microregional developments.

Question: Do you feel that the results have been positive?

Answer: We pay a great deal of attention to reports and information on everything that is being done in the nuclear field, because if we do not know of and understand these developments, this field may be mismanaged. The investment we are making is a large one, but I am convinced that it will produce immediate benefits in areas like agriculture, which is very important for a country that does not produce all of its own food supply. It should also provide benefits in public health, and of course, in industry. But I don't think it is appropriate to make a strict cost-benefit analysis of all this. What is important is to get started. I will repeat that this is an expensive investment for Peru, but its results will also be quite valuable.

Question: When is the center going to be ready for use?

Answer: The scheduled date is 28 July 1987. That is a very significant date for my country, as it commemorates Peru's liberation by San Martin. So we will inaugurate this project of binational interest 166 years after we gained our independence. On that date one phase--construction (civil engineering and electromechanical assembly work)--will come to an end. There will still remain a short phase of testing and then we will begin to put it in operation, probably by the end of 1987 or in early 1988, with the reactor going critical, etc.

Question: Could you give us some information on the uranium prospecting plan that is in progress? What have its results been?

Answer: Since approximately the same time that the Institute was established--in the early part of the 1950s--we have been making a major effort to conduct geological prospecting studies, relying on Peruvian geologists of very good professional caliber, some of whom were trained abroad. These studies were later carried out with the advice of the IAEA [International Atomic Energy Agency], and to some extent with the cooperation of the CNEA [Argentine National Atomic Energy Commission]. All of Peru's territory has been prospected, and it was concluded that the area of greatest probability is in the south, in the region of Cuzco and Puno. Once this phase of intial geological studies had been completed, a smaller area in the department of Puno was selected, where it is very likely that this year a feasibility analysis will begin for the extraction of uranium ore, with the cooperation of the CNEA, through experts who have worked here.

There are some other mining operations in the area I just mentioned, but they are on a very small scale. For the people of Puno and for the nation, it would be of great value if we could develop a commercial operation.

Question: We understand that the relations between the Peruvian Institute and Argentina's CNEA have been excellent in the past. How is your work on the reactor progressing, and how are your present relations?

Answer: The relationship goes back a long way, but it really took shape with the contract signed in November 1977 for the construction of the Nuclear Center. Part of the contract includes the construction in Peru of an RP0 [Zero Power Reactor]—which has been in operation since 1978. We have used this zero power reactor essentially as a tool for training technical staff in the nuclear field. The reactor went critical in May 1978 and it is totally operated by Peruvian personnel, who were trained by their Argentine colleagues.

Since that period, we have begun all the construction phases for the Center, which basically includes the RP10 [10 MW reactor] and a radioisotope plant as an annex to the reactor. I would say that the collaboration we have maintained since that date could not be better. Something has been established which I feel is very important in the scientific and technological field: a spirit of brotherhood among professionals. Outside of our contractual relationship, we have very good personal and professional ties.

Question: Getting back to the Center project, what are its major components?

Answer: I will sketch its broad outlines to show the interrelations of each of the parts. Its essential feature is the 10 MW reactor and the isotope plant. In the reactor we will primarily produce the raw materials for nuclear research and applications: radioisotopes. The radioisotopes will be processed in the plant in accordance with the requirements specific to each of the applications, and they will then be sold or delivered to the appropriate users (universities, hospitals, etc). In addition, we will have an auxiliary laboratory complex where we will have facilities for work in areas such as nuclear physics, nuclear chemistry, neutrography, and neutron activation analysis, which will all form a basic axis at the Center. In addition, some peripheral buildings like the National Radiological Protection Center and medical services will be used to study the effects of radiation on human beings, so we can set the standards covering the use of radioactive sources in Peru.

This basic infrastructure is going to be operated in accordance with our national requirements, which in some way we are going to have to continue to promote. In the first phase, the essential focus will be on radioisotopes. We can still not begin to work on basic research; the research labs are a direct support for our applications laboratories.

7679
CSO: 5100/2062

INCREASED URANIUM EXPLOITATION, PRODUCTION

Lima EL NACIONAL in Spanish 19 Jan 87 p 10

[Text] "Nature is very generous toward us," Guillermo Florez Pinedo, president of the Peruvian Institute of Nuclear Energy (IPEN), said yesterday, noting that within a very short time, Peru will be the leading uranium producer in the world. The presence of rich mines of the radioactive material has been confirmed, thus assuring our country of important economic resources.

The head of the IPEN made the statements in connection with the signing of an agreement with the Geological, Mining and Metallurgical Institute (INGEMMET), concerning joint work on a drilling program making it possible to evaluate the uranium potential of the Macusani area in Carabaya Province, Department of Puno, which has been declared an area rich in deposits of the radioactive material.

The prospecting project will last 2 years and involve investments of $5 million. It is expected to result in the location of some 10,000 tons of uranium, which on the currently depressed market would have a gross value of $500 million. The deposits are found in a very rugged area of Macusani, where technicians and engineers are now working with the very important support of the Ministry of Energy and Mining and the Ministry of Economy.

Florez Pinedo said that not all American countries have uranium. Argentina has a small mine, Brazil a large deposit, Chile is exploring, so far unsuccessfully, and the other countries have nothing. Based on our appraisals, Peru allegedly has a very rich and important mine enabling us to take over what could be called a leadership position in supplying this radioactive material throughout the world.

Some 55 signs of uranium have been found, along with 46 radioactive anomalies in an area 600 km^2 in the Puno zone, according to engineer Juan Zegarra Wuest, executive director of INGEMMET. He added that his institution will cooperate in the search for mining resources enabling the country to continue its development. Engineer Wilfredo Huaita reports that this year will be the takeoff for mining and we believe that everyone in the sector should work to help Peru regain the place it once enjoyed as a mining country par excellence.

IPEN To Open Nuclear Plant in July

Florez Pinedo, president of the IPEN, has also announced that the Nuclear Research Center of Peru will be officially opened in July of this year.

11,464
CSO: 5100/2065

GARCIA DISCUSSES NUCLEAR COOPERATION IN NEW DELHI

PY272007 Lima Panamericana Television Network in Spanish 0230 GMT 26 Jan 87

[Interview granted by Peruvian President Alan Garcia to Panamericana Television reporter Dennis Vargas on 25 January in New Delhi--recorded; no video available]

[Excerpts] [Vargas] Mr President, do these books here have anything to do with the subjects you discussed today in your long meetings with the Indian education and science and technology ministers?

[Garcia] For the past 2 days, President Gandhi and I have been discussing the need to restructure the education system, which is a goal we have set in Peru. During our talks, I found that India, too, is involved in implementing a national education policy, but of course on a much larger scale than the one we are working on in Peru because it is directed at a population of 750 million people.

The science and technology minister, who also met with me, and I discussed several issues. One of them was how to include computer technology and cybernetics in the educational system, and in the everyday life of Indians and Peruvians.

We believe that despite our status as poor countries of the Third World, we do not have to follow the same steps that rich countries have taken in this regard. We need to achieve technological development, and one way would be through the use of computers. Another could be by following India's steps in the nuclear field.

This is what I have been discussing in detail with the science and technology minister, and also with the Indian prime minister.

Despite its poverty and its status as a rural state, India has taken a great technological leap forward in the nuclear field and is able to manufacture nuclear reactors to produce energy to promote its development.

Peru's nuclear program is still in the planning stage, but we do have a nuclear research plant that is under construction. In addition, we are discussing the possibility of a nuclear cooperation program with India so that we can learn from India's 25 years of experience in this field.

/12232
CSO: 3348/187

PAPER GIVES OVERVIEW OF BANGLADESH NUCLEAR ENERGY PROGRAM

Atomic Energy Commission

Dhaka THE BANGLADESH OBSERVER in English 11 Jan 87 pp 8, 9

[Text]

THE programme of Bangladesh Atomic Energy Commission (BAEC) includes research and development activities in various fields for the peaceful applications of atomic energy. The efforts in nuclear research actually began in 1965 with the establishment of the Atomic Energy Centre at Dhaka. After brief period following the liberation of Bangladesh in 1971 Bangladesh Atomic Energy Commission was formed in February 1973 through the promulgation of a Presidential Order. An organogram of BAEC is given showing its set-up and its different establishments.

Since its formation BAEC is playing a pioneering role in the country's nuclear research programme. BAEC has undertaken research and development programme in the peaceful uses of atomic energy in its various establishments to develop indigeneous expertise and gain the cherished goal of self-reliance through national efforts and international cooperation.

It is a part of BAEC's programme to train scientists, engineers and other technical staff in nuclear physics, chemistry, isotope applications, radiation biology, electronics, materials science, engineering, computers, nuclear medicine etc. The training is absolutely essential to build the base of scientific and technical manpower so vitally needed for the economic development of the country.

The R & D programmes in physical sciences, bio-sciences and nuclear power have been undertaken keeping in view the overall needs of the country and they are, essentially goal-oriented, such that the results can be directly applied for economic betterment— be it in agriculture, food, industry, power, health or medicine. Programmes are chosen in a manner so that the priority, aspiration and needs of the country are amply reflected in their execution.

The R & D activities being carried out by the scientists and engineers of BAEC are summarised in the following:

Isotope applications in Industry & Hydrology

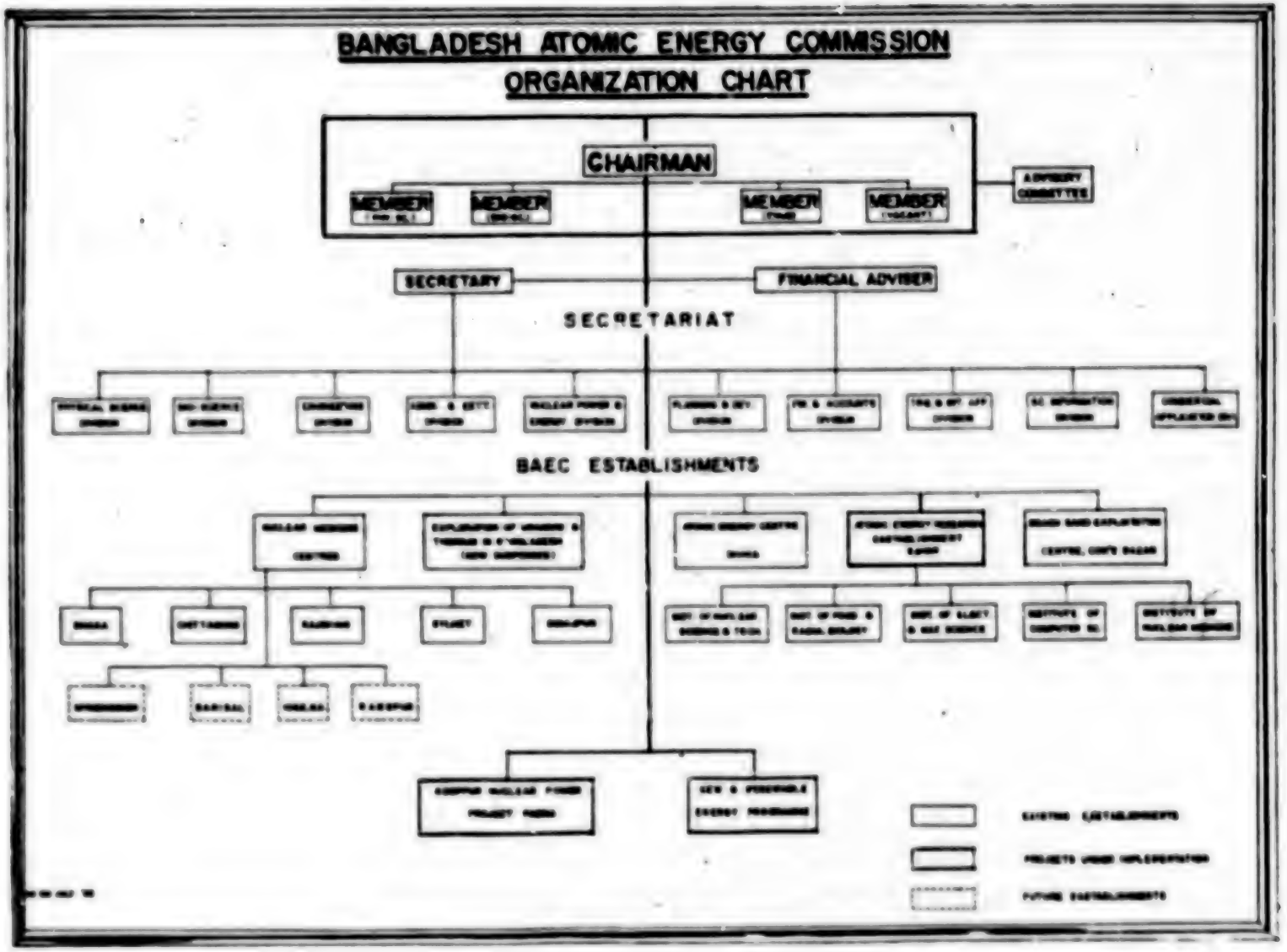
BAEC personnel are giving non-destructive testing (NDT) services to different establishments in the country like the Bangladesh Air Force, Ghorasal Fertiliser Factory, Chittagong Oil Refinery, Siddhirganj and Khulna Power Stations, etc. BAEC has signed contracts with the Bangladesh Water Development Board and the Natural Gas Fertilizer Factory Ltd. to render NDT sevices to these establishments. The services include, checking of pipe line joints and finding out defects in casting, detecting internal corrosion, testing weld joints etc. with X-ray and gamma ray radiography. This work will be extended to neutron radiography using the neutrons from the recently established research reactor at Savar. Applicationof tracer techniques in solving different problems in hydrology like studies on efficient exploitation of ground water, sand and silts movement etc. are also beingg looked into.

Electronics and Small Scale Production:

BAEC is giving due emphasis on the R & D programmes in electonics including design, development and fabrication of nucleonic and other electronic equipment. Small scale production of some instruments has been envisaged. BAEC personnel are not only providing repair and mintenance services to the different establishments of BAEC but also extending their services to various other research organisations and universities of the country. Several courses have been conducted to train electronics technicians of BAEC and some other outside organisations. Two national conventions of electronics experts of the country have been organised and their recommendations submitted to the government.

Health Physics:

In order to ensure protection against the deleterious effects of ionising radiations BAEC has undertaken some broad based programmes on personal radiation monitoring of occupational workers, survey of X-ray machines in Bangladesh and assessment of radiation exposure and environmental radioactivity and radiation monitoring. A comprehensive survey of diagnostic and therapeutic X-ray machines has been made throughout Bangladesh. Results have shown that protective measures are inadequate in most cases. The formation of a National Radiation


BANGLADESH ATOMIC ENERGY COMMISSION
ORGANIZATION CHART
CHAIRMAN
MEMBER
MEMBER
MEMBER
MEMBER
SECRETARY
FINANCIAL ADVISER
SECRETARIAT
BAEC ESTABLISHMENTS

Protection Board and the enactment of radiation control regulations are under active consideration of the Government. Health Physicists of BAEC provide, on a regular basis, radiation protection and utilization services to BAEC laboratories as well as to other medical institutions, hospitals, defence services etc.

Heavy and Nuclear Minerals:

The pilot plant at Cox's Bazar has been in operation for a number of years where heavy minerals such as zircon, rutile, ilmenite etc. are separated from the beach sand. These minerals, to a certain extent, are consumed in the local industries. They have a fairly good export market as well. A feasibility study is being carried out now for a commercial plant for the exploitation of beach sand.

Radioactive anomalies have been detected in some regions of the country. Results obtained from our exploration show potential for economically viable deposit of Uranium and Thorium in Bangladesh.

Chemistry and Experimental Physics :

Analytical methods such as particle induced X-ray emission, Radioisotope—induced X-ray fluorescence, Flame Atomic Absorption Spectrometry and Molecular Absorption and Fluorescence Spectroscopy have been developed in the BAEC laboratories. Some of these methods are used to provide analytical services to various outside organisations. Considerable amount of work has been performed in the trace element analysis of various samples including water, human hair, nail, pulses, tobacco, fodder materials etc. using the Van-de-Graaff accelerator at the Atomic Energy Centre,. Dhaka.

Materials Research

The materials scientists and metallurgists of BAEC are actively working on the development of some soft magnetic ferrite using magnetite from locally available beach sand. Other materials of interest are hard magnetic ferrites and ceramic materials. Radiation damage studies of materials will be taken up around the research reactor.

Agriculture

Better mutant varieties of rice, Jute, pulses and some other crops have been evolved using nuclear radiation at the Bangladesh Institute of Nuclear Agriculture at Mymensingh. Optimum use of the different fertilisers, contents of various macronutrients in different types of soil and radiation sterilisations of insects have been studied at the Institute. Some of these results have already been extended to the farmers.

The Institute is now under the administrative control of the Ministry of Agriculture to ensure better coordination. BAEC, however, continues to maintain a close liaison with the IAEA and train manpower in nuclear agriculture.

Nuclear Medicine

Bangladesh Atomic Energy Commission is rendering valuable services to the country's population through its several nuclear medicine centres. Radioisotopes are used for both diagnostic and curative purposes. The investigation include diagnosis and treatment of thyroid gland deseases, scanning of brain, liver, kidney, bone etc., identification of the diseases of liver and skin due to malnutrition and localisation of tumors in various parts of the body. With the establishment of the 3 MW(t) research reactor at Savar some of these radioisotopes and radiopharmaceuticals for example, Technitium-99m, Iodine-131, Fluorine-18 etc. will be produced locally saving a considerable amount of foreign exchange.

Food Preservation and Medical Sterilization

BAEC has made laudable achievement in using nuclear radiation for food preservation, pest control and medical sterilization. Experiments are also being carried out for genetic improvement of microbes and higher plants that are of economic importance. With its experience of running a pilot scale plant (50,000 curie) for a number of years for food preservation and sterilization of medical supplies BAEC is now actively considering to procure a commercial plant of 200,000 curie strength. The first such commercial plant is going to be established in the port city of Chittagong by 1988 followed by several more in different parts of the country.

Nuclear Power

Per capita commercial energy consumption and electricity generation in Bangladesh are respectively about 60 kg coal equivalent and 38 kwh. Apart from natural gas which can be better utilised in fertiliser and petrochemical industries Bangladesh has no other significant potential for power production. Nuclear Power is by far one of the best available options for the solution of the problem of ever increasing energy need of the country. BAEC is leaving no stones unturned to realise this goal of having nuclear power in the country. The importance of nuclear and associated technology research becomes even more pertinent and meaningful when we go for nuclear power.

A 3MW(t) research reactor has recently been installed at Savar, Dhaka where studies of different aspects of reactor physics, materials science, neutron scattering, neutron activation, neutron radiography, nuclear chemistry etc. will be undertaken in addition to the production of radioisotopes and radiopharmaceuticals. The research experience so gathered will go a long way in developing indigenous expertise and in creating self reliance and this will usher Bangladesh into the world of high and sophisticated technology.

New & Renewable Sources of Energy (NRSE)

New and renewable sources of energy could play an important role in meeting a part of our future energy demands. BAEC has initiated a modest R & D programme in NRSE which includes studies on solar energy and rural energy planning etc.

International Cooperation

Bangladesh has been a member of IAEA since 1972 and has been continuing to receive excellent support in the form of equipment, expert services and research contracts from the Agency through its Technical Assistance Programme to bolster our R & D activities.

One of the most important activities of IAEA is the Regional Cooperation Agreement (RCA) between some Asian countries of which Bangladesh is a Founder Member. A number of regional research and development programmes in the fields of agriculture, food, medicine, industry and nuclear science and technology are now in progress and Bangladesh is taking part in most of them.

Savar Research Establishment

Dhaka THE BANGLADESH OBSERVER in English 11 Jan 87 p 8

[Text]

The concept of having an integrated laboratory complex for research and development activities in nuclear science and technology materialised with the acquisition of almost 260 acres of land at Ganakbari Mouza at Savar, twenty five miles away from Dhaka, in 1975. Due to integration of laboratories it was surmised that there would be a substantial saving in investment and operation costs by sharing experimental facilities like research reactor, computer, radiation sources, neutron generator and other common facilities like a central library, a central engineering workshop etc. The development of the plot started in the beginning of 1976. Within a span of less than ten years the different research institutes and a residential colony have been constructed at the campus of the Atomic Energy Research Establishment (AERE). The Institutes are:

1. Institute of Food and Radiation Biology (IFRB).
2. Institute of Nuclear Science and Technology (INST).
3. Institute of Electronics and Materials Science (IEMS).
4. Institute of Computer Science (ICS).
5. Institute of Nuclear Medicine (INM).

The last named institute is presently located at the Institute of Post Graduate Medicine and Research (IPGMR) at Dhaka.

At present the residential colony consists of eight buildings with eighteight units of living accommodation for the employees of AERE. The construction of some more residential accommodation has been assigned top priority in the second phase and will soon be started. In the campus there is an Engineering and General Services (EGS) unit giving engineering, repair/maintenance and technical services in civil, mechanical and electrical works to the different institutes of AERE as well as to the other establishments of BAEC. EGS is also engaged in the operation and maintenance of the gas distribution system, telephone system, water supply system etc. The central engineering workshop has been fulfilling the technical requirements of the various institutes by manufacturing spare parts and doing the electrical, welding and carpentry jobs.

The project unit of AERE is responsible for the planning and execution of the civil, electrical and mechanical works and developing various services facilities.

Apart from these there are also a central library, a central administration building, a guest house and clinic. The first phase of the works has just been completed. The R & D programme of the five research institutes of AERE are given elsewhere.

Research Reactor

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[Text]

Bangladesh Atomic Energy Commission signed a contract with M/S. GA Technologies Inc. (G.A) of U.S.A. in November, 1979 for the supply and installation of a 3 M.W Pulsing type TRIGA MK-II research reactor at the Atomic Energy Research Establishment (AERE) at Savar. This reactor which has been commissioned in the third week of last October, is the first nuclear reactor in the country. Through the successful implementation of the reactor project and subsequent reactor start-up, Bangladesh has entered the nuclear arena to create a base for peaceful uses of atomic energy in the country. The total cost of the reactor project was about Tk. 18.00 crores with a foreign exchange component of about Tk. 12.00 crores. The entire project was financed by the Government of Bangladesh from its own cash resources. With the completion of the research and supporting laboratories in the near future, over 500 scientists, engineers and technicians are expected to work around the reactor facility.

Background

The overall reactor project was made non-turnkey to the extent possible with a view to maximising local participation as an effort towards transfer of technology in nuclear and related fields in the country. In fact, about 40-50% of the entire project was implemented through local efforts under the supervision of BAEC engineers and scientists.

Under this project, while the supply and installation of the reactor at the site were performed by GA, the design, supply and construction of the reactor building (including reactor foundation, underground trenches, decay tank pit and all other reactor interfaced civil works) and various other related services/systems such as electrical system, air-conditioning and ventilation systems, reactor secondary cooling system, demineralised water system, airtight doors for the reactor building, transient rod compressed air system etc. were in BAEC's scope of responsibilities.

The installation/commissioning works of the reactor were undertaken sequentially in three phases, namely, shield construction, electrical and mechanical component installation and start-up.

The first phase of works has been completed by GA in May 1984 with the help of BAEC engineers and scientists and local contractors. It may be mentioned here that the high density shield structure around the reactor tank was constructed using locally available ingredients

(ilmenite and magnetite) processed at BAEC's Beach Sand Exploitation Centre (BSEC), Cox's Bazar thus saving a substantial amount of foreign exchange.

The second phase of works was undertaken in May 1985 and it continued till middle of September 1986 with a few interruptions in between due to delays in receiving some reactor components from GA as well as non-completion of some interface works under BAEC's scope of responsibilities owing to unavoidable reasons.

The final phase of the reactor commissioning i.e. reactor start-up began in the second week of September 1986. The fuel loading of the reactor started in the afternoon of September 13, 1986 and the reactor went critical in the early morning of September 14. The reactor achieved full power (3MW) level on October 1, 1986 and all the testings completed in the third week of October last.

The research reactor and its safety aspects

The inherently safe TRIGA MARK-II reactor is a light-water cooled, graphite-reflected reactor designed for continuous operation at a steady-state power level of 3 MW (corresponding to an average thermal neutron flux level of about 1.2 X10.13 neutrons-cm²sec) and for pulsing with maximum reactivity insertions upto 1.4% (2.00) achieving a peak power of about 852 MW.

The reactor is fully fuelled by solid, homogeneous mixture of E-U-ZrH alloy containing 19.7% U-235, 20 Wt.% uranium, zirconium hydride and 0.47 Wt.% erbium. The reactor is located in a tank structure of concrete shield (housed in a hall of 20.22m X 23.4m having a height of 17.37m) and is covered by about 6m of demineralized water over the reactor core. Cooling is provided by natural circulation upto 400kW power level and by forced circulation of tank water for higher powers through the core which in, in turn, cooled and purified in external coolant circuits. The reactor is controlled and brought to different power levels with the help of five fuel-follower and six-follower control rods containing borated graphite.

The reactor core (which is the heart of the reactor where self-sustained fission chain reactions take place) is at the bottom of the reactor tank which has an inside diameter of 2m having a depth of 8.2m and a wall thickness of 0.63cm. The core and reflector assembly is a cylinder approximately 1.1m in diameter and 0.89m high. The core consists of a lattice of fuel-moderator elements, graphite dummy elements and control rods and is surrounded by a graphite reflector and a 5cm thick lead gamma shield. The outer wall of the reflector housing extends 0.8m above the top of the core to ensure retention of sufficient water for after-heat removal in the vent of a tank drain condition. Additionally, in case of loss of cooling water in the reactor tank, there is a provision of emergency core cooling system (ECCS) with a backup water supply to the reactor core from the pool-top water reservoir of the reactor building.

The unique safety feature of the reactor is the prompt negative temperature coefficient of reactivity of the fuel-moderator material. The control is based on the negative temperature coefficient of reactivity, which decreases the power level to normal operating values in a fraction of a second. The same characteristic also restricts the upper steady-state thermal power level that may be obtained with a given amount of fuel. Thus, both transient and steady-state operation have inherent safeguards which do not require manual, electronic or mechanical control.

The safety and conservative design of the reactor have permitted TRIGA systems to be sited in urban areas using building without pressure type containment, such as is normally associated with reactors of similar power levels. Accepted safety analysis techniques have been used to evaluate the characteristics of this reactor facility, and the analysis indicate that the TRIGA reactor system now operational at Savar will pose no health or safety problem to the public in either normal or abnormal conditions.

Apart from the inherent safety features of the TRIGA reactor system mentioned above, the reactor systems have built-in engineered protective systems. Moreover, the reactor facility at AERE, Savar has several additional building design features and ancilary services/systems mentioned earlier to make the overall operation of the reactor facility efficient, safe and reliable.

As regards the radioactive wastes resulting from the reactor operation, it may be mentioned that these will take the form of solid, liquid or gas in small quantities having insignificant effects on the environment. These will be stored or disposed of as per standard procedures and will cause no problems or hazards to personnel in the reactor building or to the general public.

Utilization of the reactor

The reactor has extensive experimental facilities which include four beam ports, one horizontal graphite thermal column (now filled with concrete blocks), one rotary specimen rack, one pneumatic transfer system and several in-core irradiation positions. The reactor can, therefore, be used to provide intense fluxes of neutrons and gamma radiation for a wide range of applications in different fields of research, for production of radioisotopes for their uses in agriculture, medicine and industry and to impart training.

Th research reactor at Savar has been set up as a first step to establish a scientific and technological base in the field of nuclear science and technology in the country. The reactor will also be used as a back-up facility for future nuclear power programmes of the country as well as to achieve technological developments in various branches of science and engineering.

Electronics, Material Science

Dhaka THE BANGLADESH OBSERVER in English 11 Jan 87 p 9

[Text]

THE Institute of Nuclear Science and Technology which has its beginning as Institute of Nuclear

Technology is one of the first to be established at AERE. R&D work of both fundamental and applied nature are carried out in six divisions of this Institute. Programmes of the individual divisions and the achievements so far made are briefly enumerated below :

Health Physics & Radiation Protection Division

The activity of this Division is concentrated on various R&D and routine work pertaining to protection and safety of the occupational workers, the members of public and the environment from the deleterious effects of ionizing radiations. The important R&D activities include environmental radioactivity monitoring, radioactive waste management, improvement of the precision and the accuracy of radiation dosimetry etc. The routine activities essentially include maintenance of safe working conditions, conducting mandatory inspection and surveillance, implementing rules and regulations in accordance with the recommendations of the International Committee on Radiological Protection (ICRP) and imparting necessary advice to the personnel working with radiation.

Nuclear Chemistry Division

This Division is engaged in carrying out research work in the fields of nuclear, analytical and radiation chemistry. Various samples of indigeneous uranium bearing minerals have been analysed and it has been found that uranium content of some of the samples is reasonably good. A large number of environmental and soil samples and water of the reactor pool are being chemically analysed on routine basis. Chemical analysis of the reactor shielding materials developed from locally available materials has been done.

In radiation chemistry work using radiation is being carried out on wood-plastic composite in order to improve the quality of low grade indigeneous wood. It is also envisaged to develop processes for radiation-cured surface coating of wood, paper and plastic; radiation induced cross-linking of the insulating materials and radiation volcanization of natural rubber latex.

Nuclear Minerals Division

The main objective of this Division is to conduct exploration for nuclear raw materials in the country.

A study of the geological set-up of Bangladesh and the surroundings reveals the favourability criteria for uranium accumulation within (a) the sub-surface of the platform of the Bengal Basin that comprises the north-western districts of Bangladesh and (b) the folded flank of the basin, i.e. the tertiary rocks exposed along Sylhet, Chittagong and Chittagong Hill Tracts.

Following are the activities and achievements in the field of uranium exploration within the span of last ten years.

Reconnaissance radiometric survey and detailed radiometric and geological survey were conducted in different areas of greater Sylhet district and part of Chittagong and Chittagong Hill Tracts. About 35 sq. km. in the selected areas of Sylhet was also surveyed with radon emanometer.

As a result of the above field work more than 300 radiometric anomalies with radioactivity having range of 3 to 20 times background in the field of concentration of Thorium of 100 to 1000 ppm (parts per million) and of 10 to 300 ppm for that of uranium have been found. Moreover, Fultala anomaly at Harargaj anticline in Sylhet with radioactivity of sixty times background and Uranium concentration of 1020 ppm (max) has been discovered. Gamma logging performed in all the 36 drilled holes in Sylhet area has established the existence of numerous sub-surface radiometric anomalies with radioactivity range of 3 to 21 times background. The results so far obtained, are quite encouraging.

Radioisotope Production Division

This Division of INST is entrusted with the production of radioisotopes and radiopharmaceuticals in the 3MW research reactor at Savar. A programme has been chalked out for the production of a selected number of short-lived radionsotopes which will be used for diagnostic and therapeutic purposes in medicine, agriculture, industry and scientific research. At present the entire demand of radioisotopes is met up by importing them from abroad. With the installation and commissioning of the research reactor along with production and quality control facilities, the locally produced radioisoptopes will, to a large extent, meet up the demand saving a substantial amount of foreign exchange. The programme includes the production of the following radioisotopes and radiopharmaceuticals :

Fluorine-18, Sodium-24, Potassium-32, Sulphur-35, Chromium-51, Cobalt-57/58, Iron-59, Technitium-99m, Iodine-131, Gold-198 etc.

For processing and quality control a radioisotope production laboratory is being set up. Meanwhile, R&D work is being carried out for labelling of pharmaceuticals like hippuran and production of radioimmunoassay kits.

Reactor Engineering & Control Division

This Division has been engaged in research and development activities in the field of reactor engineering and control and instrumentation. The work includes R&D efforts in the wide spectrum of reactor engineering, development of shielding materials and design and development of 'automatic control' based systems/equipment. The work on automatic control-based system ultimately will lead to development of expertise for the design and development of digital control system for the TRIGA MARK-II reactor at AERE.

Among the achievements of this Division noteworthy are: development of special concrete shielding for the TRIGA reactor, development of polyboron—an important neutron shielding material and certain automatic control based equipment. The heavy shielding concrete for the TRIGA reactor has been developed by the scientists using indigeneous materials such as ilmenite and magnetite form beach sand of Cox's Bazar. Polyboron—a material to be used as shielding of neutrons has been developed by the commission's scientist and has already been ptented. Some of the equipmemt developmed in the Division are: temperature controller, stabilized dc power supply, cordless calling bell, telephone monitoring amplifier, public address system, traffic control system, uninterrupted dc power supply, etc. A few of these are now ready for commercialization.

Reactor & Neutron Physics Division

The Division has taken up various

R&D programmes around the two central facilities—a 14 MeV neutron generator installed in 1984 and the 3MW research reactor which went critical only a couple of months back. The Division has recently set up a liquid nitrogen plant with a production capacity of about 10 litres/hour.

Using the neutron generator, cross-section and excitation function measurements for neutron induced reactions for materials with applications in fission and fusion reactor technology have been made.

Trace element analysis in soil, geological and biological samples will be made by using the neutron activation technique. Neutron radiography studies of neutron shielding materials, nuclear fuel elements, corrosion in metals and alloys defects in thick steel, cables etc. have been planned. Both the techniques of neutron activation and neutron radiography have wide applications in forensic science.

Netron scattering is a powerful tool for both basic and applied studies in materials science, biological systems, magnetic structures and textures etc. The unique properties of a neutron as regards its penetration power and its ability to distinguish different isotopes has made neutron scattering a very formidable technique. At present the scientists of the Division have taken up the work of designing and development of a double axis neutron spectrometer.

Studies of theoretical aspects of reactor and neutron physics vital for the development of nuclear reactor technology and studies in plasma physics are also taken up.

THE Institute of Food and Radiation Biology (IFRB) was established in 1979 for the application of radiation and radioisotopes in biological research and development in the fields of food preservation, medical sterilization, genetic improvement of industrial microorganisms and other biotechnological and genetic engineering research. Research in food irradiation was initiated in 1965 with the establishment of Atomic Energy Centre, Dhaka. The Investigations were carried out in small scale on the disinfestation of grains, sprouting inhibition of potatoes and onions and delay in the ripening of tropical fruits with a 5000 Curie 60 Co gamma source. It was established that irradiation would be very suitable for preservation of some food items by controlling microorganisms, insects and some physiological processes. With the establishment of a gamma irradiator of 50,000 Curie 60 Co in 1979 the R&D activities in these fields were widened in some cases upto pilot-scale and semi-commercial level.

The significant achievements of the Institute in peaceful application of atomic energy is described here in brief.

Food Preservation

a) Sprouting inhibition of potatoes and onions.

The annual potato production in Bangladesh amounts to over 1.2 million tons. Owing to inadequate storage facilities majority of the produce is stored at ambient temperature incurring significant loss due to rotting, sprouting and dehydration. It has been observed that a low dose of radiation results in complete inhibition of sprouting and storage of irradiated potatoes around 12-15°C maintains good edible quality upto 12 months with minimum storage losses. Local varieties of onions do not keep well in cold storage. Onions irradiated at low dose of radiation followed by storage at ambient temperature under proper ventilated condition results in significant reduction in storage losses due to dehydration, rotting and sprouting.

Computer Science Institute

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[Text] THE Institute of Computer Science (ICS) came into being as a component of the Atomic Energy Research Establishment, Savar and started functioning in December, 1981. The main objectives of the Institute are to carry out computational works in order to foster scientific research and development programmes of BAEC, undertake R&D activities in computer science and render educational and data processing services to other organisations of the country.

ICS takes its heritage from the pioneering role of BAEC in introducing the first computer in the country— an IBM 1620 as early as 1964 in the Atomic Energy Centre, Dhaka. It is well known that this computer gave tremendous service to the research workers of BAEC and other organisations in the fields of nuclear science, engineering, mathematics, statistics, economics and social sciences. The organisations that benefited from this facility are Planning Commission, BIDS, Education Commission, IWTA, WAPDA, Meteorological Dept. Urban Development Directorate, BARD Diabetic Association, Forest Dept., DSO, universities of Dhaka, Chittagong, Rajshahi and BUET to mention only a few.

This encouraged and inspired the scientists to embark on solving more complex and complicated problems employing extensive algorithms and iterative methods. Gradually the work load on the computer grew manifold and real time problem of practical importance could not be tackled due to speed and memory constraints. The necessity for a high speed large memory computer was felt essential. Moreover, with the maintenance spares going out of production the computer became inoperable and was finally abandoned in mid eighties.

In order to fulfil the dire necessity, a fourth generation computer— an IBM System/4341 (4 Mega Byte) with all necessary peripherals and an IBM 5280 Data Entry System had been procured and installed at the central computing facility of the Institute of Computer Science at AERE, making it the largest computer installation in the country.

The software environment is made up of the following compilers and programme products installed under the Operating System DOS-VSE/AF :— VS-fortran, COBOL, ASSEMBLER,POWER, ICCF, DITTO, SORT-MERGE, VSAM etc. Data preparation on diskette can be made both at Dhaka (Atomic Energy Centre, Dhaka campus) and Savar.

The Institute has engaged in a broad spectrum of activities starting from system analysis and design to development of computer programmes for computer resource management and a variety of application

oriented problems.

1). System management programmes— For an efficient and effective operation of the IBM 4341 system with its new architecture and advanced system software, a sound knowledge in the current state of the art is of paramount importance. Keeping this in view, the operating system and other system softwares have been loaded with update and modifications, incorporating necessary procedures, macros and routines.

(2). Development of data bases— The programme consists of development of a variety of application programmes of diversified fields to collect and store together interrelated data with controlled redundancy serving one or more application areas. In this respect a number of programmes have been developed.

i) Personnel information management system— The analysis and design of the system has been completed and several programmes of administrative interest have been developed.

ii) Accounting system— A number of programmes have been developed to computerise the accounting system.

iii) Library information system— This project is aimed at creation of a data base to provide computer-based library-user services requiring complicated searching, sorting and report making.

(3) Development of a programme library— This is an on-line library of well documented programmes intended to serve different application areas of mathematical and statistical interests. A good number of programmes have been developed in the above areas.

(4) Implementation of nuclear codes—In collaboration with the scientists of INST, considerable progress has been made in the implementation of nuclear codes obtained from different nuclear research laboratories around the world. To name a few, ANISN, a package from the Oak Ridge National Laboratory, USA is used for the solution of Boltzmann Transport equation, for reactor criticality calculation, reactor analysis, shielding calculation and group collapsing of the cross section library The code 'HELGA', obtained from Nuclear Research Centre, W. Germany is used for calculation of neutron cross section using Hauser-Feshbach analysis.

A few other programmes of scientific interest are

(i) Data- analysis of neutron diffraction from Δ^6, Δ^7 and cholesterol in membranes (ii) data analysis for small angle neutron scattering from neurotoxin, cytotoxin,cytotoxin A and £-Chymotrypsin.

Services to outside organisations: —

Computational and data processing services have been rendered to different organisations like.

(i) Sugar Cane Research Institute, Ishurdi, on linear programming problem.

(ii) Institute of Business Administration (IBA), DU on Project information system study

(iii) Water Development Board on ground water development studies.

(iv) T&T Board on telex billing

(v) BAMANEH on social science data analysis etc.

To be in tune with the past glory, BAEC possesses the expertise to impart training in the field of computer and render computational and data processing services to other organisations in the country

Food, Radiation Biology

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[Text]

For the last four years semi-commercial studies on packaging, storage, transportation, marketing and consumer acceptability of irradiated potato, onions and dried fish were completed. It was found that this processing technology is techno-economically feasible for introduction in Bangladesh.

b) Disinfestations.

A conservative estimate indicates that around 10% of the stored cereals is lost due to insect infestation. The losses will be much higher if pulses and other agricultural products are included. Detailed entomological studies together with radiosensitivity of individual pests have been determined and radiation dose level has been optimized for commercial disinfestation of food-grains. Effective radiation technology for disinfestation and storage of pulses, beans and oil seeds has been developed on semi-commercial scale with locally available packaging materials to check reinfestation.

More than half of marine catch of fish is sundried. The dried fish is subjected to heavy insect infestation and fungal attack in storage. Radiation has been used most effectively in disinfesting the dried fish and reinfestation has been checked with the development of proper packaging materials.

c) Pest Management.

Insect can be controlled by the application of sterile insect technique. Mass rearing technique has been developed in IFRB for the

production of blow flies which cause tremendous loss of dried fish during the process of drying. Effective dose for the sterilization of these flies by radiation has been determined and laboratory scale experiments have been conducted which show that when radiosterilized insects are released to normal population, infestation is controlled. This technique can also be applied in other insect pests. Besides, research project have been undertaken to control insects by hormones and pheromones which regulate the insect behaviour and development.

d) Shelf-life extension of fishes, fruits & vegetable:

Fish is spoiled due to microbial attack and autodegradation by enzymes. Radiation can drastically reduce the microbial load and together with refrigeration can extend the shelf-life by 2-3 weeks. The experiments were conducted with carp, hilsa, mackerel and shrimps and encouraging results were obtained for shelf-life extension of these fresh fish.

Shelf-life extensions of some fruits and vegetable have been obtained by delaying ripening with application of gamma irradiation at some physiological state.

e) Wholesomeness of Irradiated Food:

Efficacy of irradiation technology for food preservation through control of microorganisms, insects and/or physiological processes have been established for more than 20 years. Based on extensive studies on the wholesomeness and safety of irradiated foods, 22 countries have given clearance of over 40 irradiated food items for human consumption. And it has been recommended by International Expert Committee of FAO, IAEA and WHO that radiation treatment of any food item upto 10 kgs is safe for human consumption. Based on our experimental findings and the reports from other countries Bangladesh Government has given clearance for irradiation of a good number of food items.

Medical Sterilization

a) Sterilization of Medical Products and Supplies:

An important peaceful application of atomic energy include, sterilization (elimination of microorganisms) of medical products and since the process is a cold one it is highly effective for thermolabile plastic products. Microbial load and distribution of microorganisms in different products of a large number of medical supplies and products have been determined and radiation sterilization dose established.

On the basis of research findings, commercial services for sterilization of vasectomy and tubectomy kits for family planning programme, intravenous transfusion sets, shell dressing, ophthalmic ointment, maternity kits, etc, are being offered to various Government and Private Organisation.

b) Tissue Banking:

Research work is in progress at this institute for the development of effective methods for the radiation sterilization and preservation of tissue grafts like membranes, bones, etc. for utilization in rehabilitative surgery. Presently, work is in progress with amniotic membranes which could be used in burn surgery. The ultimate aim is to help establish a Tissue Bank in the country for supplying sterilized grafts for surgical purpose.

Biotechnology

a) Genetic Improvement of Industrial Microorganisms:

i) Citric Acid: An improved strain of *Aspergillus niger* has been evolved by application of radiation technique which is capable of producing about 100% more of citric acid than the original strain. The study is now at the pilot plant level which will lead to commercial introduction.

ii) Enzymic Degradation of Agricultural Waste: Experiments are being conducted for the bio conversion of agricultural waste like jute stick, bagasse, saw dust, straw, etc. to power alcohol by suitable enzymic and microbial process.

b) Tissue Culture Technique:

Tissue culture method is being used for production and regeneration of agricultural plants like jute and high biomass producing indigenous plants like Ipil Ipil, Sesbania, Cajanus, etc. This will lead to mass production of fuelwood and animal feed in the country.

In addition the activity of the institute has been extended to fundamental understanding of mechanisms of biological effects of radiation. Mutagenicity and toxicity studies, molecular mechanisms of gene action with special reference to hormones, ageing mechanisms etc. and other activities in microbial technology and genetic engineering.

Conclusion

The Institute of Food and Radiation Biology is engaged in the peaceful application of ionizing radiation for preservation of food stuffs, sterilization of medical supplies and pharmaceuticals and development of applied biotechnological processes. The primary objective of these R & D activities is to improve the lot of the commonman through increased food supplies, and better health care materials and to develop a technical base for economic prosperity of the country.

/9274
CSO: 5150/0082

VISITING IAEA CHIEF HOLDS PRESS CONFERENCE

Dhaka THE NEW NATION in English 30 Dec 86 pp 1, 8

[Text]

Dr Hans Blix, Director General, International Atomic Energy Agency (IAEA) has assured Bangladesh of all possible help if the Government decides to have a power reactor.

The chief executive of the IAEA, who is in Bangladesh on a four-day visit told a press conference in Dhaka yesterday that he was impressed with the level of expertise in Bangladesh in matters of nuclear plants. In this connection he referred to the Savar atomic reactor and said it would also produce isotope for the use of medicine and agriculture. He said that Bangladesh is the biggest recipient of technical assistance of the IAEA in Asia.

Dr Hans Blix predicted a marked increase of nuclear power consumption in both the developed and the developing countries within a few years.

He said the demand for power was also increasing in the developing countries and nuclear power was one of the best alternatives open to them.

Regarding the hurdles faced by the developing countries in raising necessary fund, developing manpower and adopting regulations for nuclear power, he said a committee of experts, formed by IAEA, was given the task of examining these aspects.

BHOPAL GAS LEAKAGE

Dr. Blix said that the gas leakage in Bhopal of India was more serious than the accident at Chernobyl nuclear power station so far public health was concerned. He said that "the Chernobyl accident was not in any way affecting the population of the three-mile island".

"It was rather an economic disaster", Dr. Blix, who himself flew close to Chernobyl and saw the flame from a helicopter during the accident, said. "The accident occured due to an error on the part of the operators. In fact, they were making an experiment which had failed," he added.

He said that the Chernobyl accident was not the biggest industrial disaster in the world. It was given an unusually extensive media coverage leading to creation of a baseless and ridiculous panic among the people about nuclear power and shook their confidence in it, he said.

Dr Hans Blix said there would be a resumption of the use of nuclear power shortly in the world. Because, he said, the nuclear power stations are at an advantageous positions compared to those of coal and oil. What is important is their proper maintenance and adequate safety measures for the environment and for their economic use, he added.

He said that today 15 percent of the world electricity was generated by the nuclear power. He said with the growing demand for power in the world, the dependence on nuclear energy would mount both in the industrialised and the developing countries. He cited instances of the developing countries and said the nuclear power plants were doing quite well in Argentina, Pakistan, South Korea and Latin America. Brazil is also switching over to nuclear power, he added.

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CSO: 5150/0080

ERSHAD, ENERGY MINISTER SPEAK AT REACTOR COMMISSIONING

Dhaka THE NEW NATION in English 12 Jan 87 pp 1, 8

[Text] Bangladesh entered the nuclear age when President H. M. Ershad activated a three megawatt research reactor at Savar, 40 kilometres off the city, yesterday.

The U.S. built Triga Mark II type research reactor will be mainly used for producing radio isotopes for medical, industrial and agricultural purposes besides helping the local scientists conduct advanced nuclear research.

Switching on the reactor, which has been set up at the cost of Taka 18 crore at the research establishment of Bangladesh Atomic Energy Commission President Ershad said that the epochmaking event marked the beginning of a new chapter in our history.

Amidst cheers from the nuclear scientists and employees at the research establishment, the President also announced that from Saturday night Bangladesh also began commercial production of crude found at Haripur field in Sylhet.

The function was presided over by Mr Anwar Hossain, Minister for Energy and Mineral Resources. It was also addressed by Mr Shafiul Alam, Secretary, Ministry of Energy and Mineral Resources, Dr Anwar Hossain, chairman of the Atomic Energy Commission and Dr Abdul Mannan of the commission. Mr Munir Ahmed Khan, Chairman and Dr Ashfaque Ahmed, member of Pakistan Atomic Energy Commission, Mr P. K. Iyenger, Director, Bhava Atomic Research Center of India and former chairman of Sri Lanka's atomic Energy Commission, ministers, diplomats, senior military and civil officials attended the inaugural ceremony.

The reactor, procured from General Atomic Company of the United States was funded by the government. It was commissioned by the scientists and technicians of the Atomic Energy Commission who completed their work in September.

Over 300 scientists, engineers and technicians will remain engaged at the reactor when the entire work regarding support facilities are completed.

A high density shield around the reactor tank has been constructed by using ilmenite and magnetite processed at the Atomic Energy Commission's beach sand exploitation centre, Cox's Bazar, saving a substantial amount of foreign exchange.

Referring to the opening of the reactor President Ershad said the event proved once again that if we had determination coupled with honesty, dedication and patriotic zeal, nothing was

impossible. "Once again it has been proved that we have no dearth of intellect and I sincerely welcome the scientisti for the achievement", he added and said, we have found oil in our country.

I am offering my gratitude to Almighty Allah for the advancement from one success to another which has stirred the nation with a new sense of hope and confidence."

President Ershad further declared that henceforth he would concentrate on making the Rooppur nuclear power project a reality. "A quarter of a century has elapsed since preliminary thought on the Rooppur project was given. Excepting some formal, high sounding words, nothing was done in this regard. But our policy is not to keep anything in cold storage. I would like to categorically announce here today that the government is determined to implement the Rooppur nuclear energy project like the Jamuna bridge project. We have already taken steps in this regard and we hope that the friendly countries would provide financial and technical assistance to implement the project", the President said.

Referring to the oil find at Haripur the President said, "Allah helps those who help themselves. I would like to congratulate the Minister for Energy and Mineral Resources and all concerned for their efforts in this regard."

He said, peace and discipline was prevailing in the country, which we would utilise for the benefit of all. "Give me peace and maintain discipline. We shall 'Inshallah swork hard to take the country towards progress," he declared.

Referring to the existing imbalance between the developed and the developing countries, he said it was mainly because of lesser use of technology in the developing countries. He said successful application of technology could hasten the use of resources in the underdeveloped world and ensure quicker development of less developed countries.

The president said we were much behind in the use of technology because of our poverty. "We have manpower, water resources and fertile land and many other resources," he said expressing his conviction that if all these could be integrated together we would be able to be one of the resource ful nations of the world.

President Ershad pointed out that there are many countries which have no resources, but because of their technological knowhow and skill they have established themselves in the rank of developed countries. 'We have no dearth of resources but I firmly believe that if we can evolve technological skill, we shall be able to make progress', he said.

He mentioned about the increase in the country's population and said to meet the requirements in various fields including the achievement of food autuky, we would have to employ dynamic technology for agriculture development and bring structural change in the production process.

He said the outline of Bangladesh in the twentyfirst century would be totally different from that of the present Bangladesh. ,With that end in view, we have given priority to communications technology and power generation, he said adding: as a result huge number of bridge projects including the Jamuna bridge project and many power generation projects were being implemented in the country.

President Ershad said there was no specific sense of direction in the past for solving the country's energy problem and as a result development efforts in the past in this sector was not consistent with the realities. The present Government has formulated plans keeping in view the future requirements and steps have been taken to materialise them, he said.

He said Bangladesh which was looked down upon by the developed world with pity a few years back for its poverty has now established itself in a dignified position in the world community. We shall have to enhance our prestige and dignity further through our united efforts, he said.

ANWAR HOSSAIN

Speaking on the occasion Mr Anwar Hossain said that the commissioning of the nation's first nuclear reactor was one of those national events which would be remembered with pride by the future generations.

Bangladesh has achieved an epoch making progress in nuclear technology with the activisation of the reactor that marks a great achievement by the scientists and techolcians of the Atomic Energy Commission, the minister said. He added that he was happy to have been connected with the project and thanked everyone for the success.

The [Energy Minister said that the presence of President Ershad at the inauguration of the nation's first reactor bore testimony to his sincere efforts and strong commitment to establish a firm basis of science and technology in the country.

He recalled the President's personal initiatives towards formulating the national science policy, formation of the Science and Technology Council and encouragement to the research and development of science to help attain economic emancipation of the people.

Mr Anwar Hossain said that it was a red letter day for the Bangladesh Atomic Energy Commission and expressed his optimism that besides production of radio isotopes for a rticultural, industrial and medical purposes the reactor would help take up wider research activities in various fields.

The Energy Minister also declared that Bangladesh was firm in its commitment to harness nuclear energy for peaceful purposes and improving the condition of the masses.

He said that since its inception the commission made important contributions towards nuclear research and application of the technology in peaceful purposes like agriculture, food preservation, medicine and industrial use.

He also acclaimed the role of the commission in discharging its responsibility in training manpower to lay the basis of a technological base to achieve self sufficiency. He also thanked the International Atomic Energy Commission for providing necessary help to Bangladesh Atomic Energy Commission in this regard.

Mr. Anwar Hossain further said that the role of science and technology, in attaining socio-economic progress in a country like Bangladesh, burdened with a huge population and varities of problems, was highly important. To achieve such objective, he said the government was determined to build necessary technological infra-structure to make the country self-reliant. In this connection he lauded the efforts of the Bangladesh Atomic Energy Commission for making valuable contributions.

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SUEZ TRANSIT OF NUCLEAR SHIPS DISCUSSED

Cairo MAYU in Arabic 5 Jan 87 p 6

[Article by Kamal-al-Din Husayn: "Nuclear Ships: Will They Cross the Suez Canal?"]

[Text] It is not an easy question. Should nuclear ships be allowed to cross the Suez Canal?

The difficulty in answering this question lies in the fact that the Suez Canal is an international waterway , but Egypt always makes its decisions with only one thing in mind: the interests of Egypt and the Egyptians.

There are those who give assurances that there is no danger or harm in nuclear ships crossing the canal and there are those who express certain reservations.

Whatever the case may be, a special committee, composed of representatives from the Nuclear Energy Authority [NEA], the Suez Canal Authority and other responsible officials, has been formed to look into the various facets of this subject to come out with a clear answer to the question of whether nuclear ships will or will not cross the Suez Canal.

The following article is an attempt to shed light on the various viewpoints on this matter.

Dr 'Ismat Hasan, vice-chairman of the Nuclear Energy and Nuclear Affairs Authority, says that "the process of nuclear ships crossing the Suez Canal does not have any side effects or problems, as evidenced by the fact that we have not yet heard of nuclear leakage or nuclear explosion or any nuclear problems by nuclear ships in the long run. Nuclear ships for a long time have been crossing the seas and oceans without any problems. These ships are owned by many countries, led by the United States, where nuclear-operated ships constitute a large percentage of the ships crossing all oceans and seas. So far, we have not heard of any problems from American or European nuclear ships and the nuclear stations themselves have not had any explosions. We have not heard of any explosions save for the one at the Soviet Chernobyl station. Other than that, no bad results or adverse effects, similar to those of the Soviet station, have occurred.

"I can affirm that a nuclear ship crossing the Suez Canal does not have any adverse effects or problems, based on what I have said, because these ships are made with safeguards against explosions and are designed with the kind of durability and sturdiness that guard against nuclear leakage or explosions, except in very rare cases. In other words, the chances of a nuclear explosion happening are very slim due to these kinds of safety features and guarantees built into the ships or into the nuclear system found in the hull of the ship. Furthermore, the ship's nuclear system is enclosed in a protective container or a safety container or an explosion container, as it is called, whereby should any malfunction in the nuclear system occur--a one in a million possibility, but should it happen--this safety container is designed to prevent such nuclear explosions or leakage. Besides the safety or protective container, there are the electronic warning and control systems and the computer that controls the explosion or nuclear leakage process directly. The committee is now studying accident possibilities, nuclear safety and safeguards and ways and means of avoiding nuclear problems.

"In principle, ship crossing will not pose any problems or danger except within the boundaries of the very slim one-in-a-million chance. This is what we are studying now."

Crossing Issue Under Study

As for Engineer Muhammad 'Izzat 'Adil, chief of the Suez Canal Authority [SCA], he reemphasized this previous statement that, in view of its gravity, this subject is under study by a committee that includes numerous sides that have definite opinions on this issue, such as the Ministry of Defense, Ministry of Foreign Affairs, the NEA and the SCA. He also affirmed that the committee will not issue any decisions until all the facets and dangers of the crossing are carefully examined and all likelihoods are explored and adequate safety precautions instituted, regardless of cost. This, no doubt, will require huge sums of money which have to be shared by the ships or owner countries.

Difficult Decision

Captain 'Ali Nasir, deputy director of traffic at the SCA, affirms that the "question of nuclear ships has two sides to it. The first side is the ships that run on nuclear fuel, a matter that is under study by a senior committee which will not come out with any decisions or statements until all the implications and particulars have been considered and safeguards against any likelihood are set. This is a very grave question and no decision can possibly be made before all parties have had a chance to express their viewpoints. Grant it that 45 percent of US ships run on nuclear fuel and sail and cross the oceans, but the countries that allow such ships to cross institute monumental safety precautions inside the ships and at any place they may cross. It is a completely different matter with regard to the Suez Canal where large concentrations of people are found in three governorates scattered along the length of the canal. Herein lies the danger, even with the presence of every safeguard and strict precautions which require huge sums of money. Therefore, nuclear ships crossing the canal must share the costs of such precautions." The director of traffic at the SCA emphasized that only

two nuclear ships so far have crossed the canal and that was under special circumstances and reasons and only after the necessary precautions and adequate pledges had been secured.

Nuclear Ships...in Classes!

He said: "The second aspect of the question is ships carrying radio-active or nuclear material. These ships are allowed to cross and are classified into classes. Class-1 ships that carry highly dangerous material must carry a $10 million insurance policy and can only cross with prior notification, identifying the load and the time of crossing. For added security, various other sides participate in the inspection of nuclear ships."

"The next grade is less harmful and the amount of insurance that must be carried is less than for class-1."

"The third class does not pose any danger and pays less insurance than the previous one and so on. In all cases, a nuclear expert must be retained."

No Economic Advantage!

Dr Muhammad al-Ghumri, chief of the Hydraulic Department of the SCA Research Center, says:

"There is no compelling economic advantage for the SCA to risk allowing nuclear ships to cross the canal. Revenue, in whatever amounts, will not cover the potential losses in the event of an accident, no matter how small. If the construction of a nuclear reactor in al-Dab'ah has created an uproar, even though it is a fixed installation in an unpopulated area and emergency plans have been drawn up to face any accidents or radioactive effects on the environment, how about if a reactor were built within our neighborhoods and populated cities?."

Hidden Advantages

Dr Muhammad al-Ghumri adds that "the possible advantages that may be reaped are hidden economic ones, be they political or other. Such advantages benefit the state and not the SCA. If crossing permission is granted, we must have the necessary capabilities to face any incident or disaster, as I prefer to call it. I say, however, there is no underlying fear of regular maritime crossing of such ships if no accidents occur, even if the ship itself were to have an accident. The danger lies, however, in an accident occurrring in the reactor that runs the ship and where such accidents are very few, this does not preclude the possibility of them happening."

Dr Muhammad al-Ghumri wondered if the state had devised a plan to evacuate the inhabitants of three cities in faster than record time. If such a plan exists, will the inhabitants respond to an evacuation drill and do we have enough shelters for them? Do we have the different specialties and necessary hospitals to help the wounde? Yes, these plans may exist in European countries and these countries may nave had numerous experiences in this. Such plans are devised for something much bigger than the explosion of a nuclear

reactor that runs a ship, for they are prepared for a nuclear world war. Such means cost huge sums of money, well beyond our consideration of how to approve or oppose the crossing of such nuclear ships. I must point out that valid SCA bylaws prohibit crossing by these nuclear units.

12502
CSO: 5100/4607

ROLE OF NUCLEAR POWER IN EGYPTIAN ENERGY PROGRAM

Kuwait AL-SIYASAH in Arabic 12 Jan 87 p 19

[Article: "Egypt Will Get 40 Percent of Its Electric Power Needs in the Year 2000 from Nuclear Plants"]

[Text] Many questions and inquiries have been raised recently about the issue of Egyptian energy from the standpoint of rationalization; its relationship to the state subsidy for electric power and the prices at which it is sold to the public; the reasons for the delay in the construction of the first nuclear plant in al-Dab'ah as well as the postponement of the al-Qattarah Depression project for generating electric power; the general status of the Egyptian oil and natural gas reserves and their rates of consumption; and atomic waste generated by the nuclear plant.

This is in addition to the evaluation of steps taken to use the current, the new and renewed, sources of energy. All these raised questions we will discuss and answers to them will definitely be found.

Regarding the consumption of electric power in Egypt, recent reports prepared by the Egyptian Ministry of Electricity confirmed that indicators of electric power consumption in Egypt call for objective examination as a result of the enormous increase in consumption rates. It was demonstrated that 60 percent of the total production of electric power is used by industry, and the remaining 40 percent for home consumption and services, noting that the rate used by industry in developing countries is estimated at about 90 percent while home consumption and services is no more than 10 percent. Meanwhile the price of electricity in these countries is estimated at nine times the current price in Egypt. This explains the extent of the subsidy offered to electric power in Egypt where the actual cost of a kilowatt is 65 milliemes, about three times as much as the cost to consumers, noting that some families still use too much electric power for TV, electric heaters, air conditioners and other appliances.

Furthermore, some studies have estimated that the average annual consumption of an Egyptian family is 500 kilowatt hours [kwh] a month. The same study established that the average annual consumption of some low-income families that do not own luxury home appliances such as TV, air conditioners and heaters is no more than 100 kwh a month. As for most middle-income families,

their average monthly consumption is between 100 and 250 kwh and the high-income ones is 3,000 kwh due to the overuse of lights, air conditioners, imported refrigerators, heaters, TV, ornaments and other things.

Therefore, the Egyptian government's call for rationalizing electric power does not mean raising the sale price of electricity and dividing it into sections, but is in reality an appeal to every Egyptian to take part in the process of rationalizing energy consumption, be it in the form of petroleum products, electricity or both.

In this respect, the Ministry of Electricity is now cooperating with the government in an attempt to direct new electric energy for production more than consumption and has embarked on awareness campaigns to stop the excessive use of electricity in homes, government offices and rural homes. So far, these attempts have not realized the desired results, but have brought about a small improvement. Perhaps one proof of that is the drop in the rates of electric power consumption from 15 to 13 percent, with the surplus being directed to some land reclamattion projects, in addition to the "sponge iron" factories in al-Dakhilah as well as some other projects. Nonetheless, the rates of consumption are very high compared to those in developing countries, not to mention the fear of depleting the stocks of materials used in the production of electric power.

Al-Qattarah Depression Project

It is common knowledge that the al-Qattarah Depression project for generating electric power has been under study for over 57 years. Egyptian and international agencies have prepared economic and technical feasibility studies on its use as an electric power generation project, but it has always been subject to numerous debates between proponents and opponents and opinions about assessing its positive sides and side effects on the environment and man at present and in the future. This has recently led to the postponement of the al-Qattarah Depression project until the Egyptian scientists finally arrive at an opinion about its implementation without any harmful side effects or negative aspects that affect the environment. It is known that the implementation of this project is linked to three key conditions that must all be present at once: the absence of any destructive or side effects on the env[illegible]nt, ground water or arable land; the establishment of the project's ec[illegible] and technical feasibility; and the availability of suitable financing on favorable terms. It is known that the side effects from submerging the al-Qattarah Depression, whose area is 12,000 square kilometers, under 60 meters of Mediterranean water may cause possible natural faults in the earth's crust through which water can seep inside Egypt, possibly causing earthquakes.

New and Renewed Energy

Regarding the use of solar energy and wind energy sources to provide energy and limit the use of oil in electric power generation in view of the fact that oil will not last for long, the Egyptian government recently signed about 10 international agreements for grants and loans for the local manufacture and expanded use of new energy equipment. Indeed, solar heaters have been manufactured and sold to the public, and electric power companies have

installed solar heaters for individuals in Cairo, Alexandria and the Suez Governorate at nominal prices. A solar fish refrigerator has been constructed at the High Dam lake in Aswan and attached to it is a 100 cubic meter a day solar pump to irrigate part of the surrounding land. A water desalinization unit has also been built in al-Hamrawayn on the Red Sea with a capacity of 50 cubic meters of fresh water a day; solar heaters to heat water in the Faith and Hope city at Nasr City and the Armed Forces Hospital at Ma'adi have been installed; and wind speed gauging and rating units have been installed east of al-'Uwaynat and Abu Ghusun on the Red Sea in order to spread as efficiently as possible the utilization of wind energy in these areas where 20-kilowat air turbines will be sent to turn on the water east of al-'Uwaynat. Moreover, the Egyptian Organization for New and Renewed Energy has been established to develop these sources and represent the Egyptian government in concluding and ratifying international agreements in this field.

Nonetheless, Egypt's energy needs will grow year after year due to the enormous increase in population growth, estimated at about 1.5 million a year. Meanwhile, oil has started to dry up and so has natural gas. Furthermore, our coal reserve is small and reliance solely on hydroelectric power is very limited given the country's future needs. Therefore, nuclear plants have to be considered because they are the only alternative to restore balance to Egyptian energy needs.

Nuclean Power Plants in al-Dab'ah

President Husni Mubarak was supposed to lay the cornerstone for a nuclear power plant in al-Dab'ah at the end of 1985 but this has been put off for a while due to the economic conditions in the country.

In general, the al-Dab'ah project was supposed to take 7 years to complete, for it includes two 2,000 megawatt nuclear reactors as part of the Egyptian national nuclear program aimed at building 8 nuclear plants with 8,000 megawatts by the year 2000 to generate 40 percent of Egypt's needs for electric power, needs estimated at about 100 billion kwh a year.

It is noteworthy that the Minister of Electricity and Energy in 1981 signed international agreements for nuclear cooperation to generate electric power with France, West Germany and the United States to buy the necessary reactors and fuel. He also signed agreements with Australia and Niger to provide the uranium as well as with the United States, Great Britain, Sweden and Belgium to provide technical training for Egyptians and to transfer technology in the field of the peaceful use of nuclear energy for power generation and related technical research and technical training at nuclear plants.

Egyptian technical cadres are actually being trained to work in these plants, noting that Egypt has hundreds of scientists, experts and nuclear energy professors and engineers ready to work at that station during the implementation, training, operation and maintenance stages, particularly since Egyptian specialists are world famous in all nuclear energy fields. Many Egyptian scientists are working in the nuclear energy field in the United States, France and England where they occupy leading positions.

It is noteworthy that nuclear reactors are the cheapest alternative for generating electric power necessary to provide for Egypt's electric energy needs for coming generations, as all scientific facts indicate. Conventional water, thermal, gas and steam-energy sources are limited and our energy needs for the year 2000 are estimated at about 100 billion kwh while the available water energy of the High Dam and the Aswan Barrage is about 10 billion kwh, in addition to about 6 billion from the operation of the second Aswan barrage plant and the electric power plants in Qanatir, Isna, Naj' Hamadi, Asyut and the large irrigation canals. We have to plan for the rest, about 84 billion kwh, because it cannot be totally produced by oil or natural-gas operated thermal plants which require 25 million tons of oil a year, or about 55 percent of our current production.

On the other hand, the al-Magharah coal mine reserves are estimated at about 35 million tons and are used to operate the first 1,200 megawatt electric power plant in the 'Uyun Musa area. With respect to solar, or renewed, energy, it is being used for heating, refrigeration and air conditioning in remote areas.

It is evident from the foregoing that the Egyptian government's strategy for the supply of electric energy for the year 2000 is based primarily on 40 percent nuclear plants, 20 percent oil, 15 percent natural gas, 15 percent water falls and 10 percent coal.

Moreover, technical and scientific studies indicate that nuclear power generation is cheaper than thermal generation using diesel fuel. The cost of producing 1 kwh at a nuclear reactor is equal to 1.5 times more the cost at thermal electric plants at the world price for exported oil used as fuel in diesel or natural gas power plants. This is because fuel costs for the production of 1 kwh at nuclear plants are two-thirds the cost of fuel used at conventional thermoelectric plants. It is a proven fact that a 1,000-megawatt nuclear plant operating on enriched fuel needs 25 [as published] enriched fuel a year at a current cost of no more than $30 million at current prices while thermoelectric plants operating on oil need about 2 million tons of oil materials at a cost of over $300 million. This means a fuel savings of over $250 million a year, enough to cover the total actual costs of the nuclear plant in 10 years.

Nuclear Safety

Concerning nuclear safety studies, Egypt had begun preparing special nuclear safety studies 9 years ago, in 1977, dealing with all nuclear safety considerations for the first nuclear plant at al-Dab'ah, in addition to evaluating all environmental safety studies in coordination with International Atomic Energy Agency advisors. It is noteworthy that Egyptian atomic [energy] scientists and experts have participated with the IAEA and the official French SUFRATOM Agency in studies to select locations on the Red Sea, the Delta coast and the northwest coast. The unanimous view was that al-Dab'ah, located on the northwest coast, is the most suitable for the construction of nuclear power plants.

These studies were conducted by the Nuclear Power Plants Agency, the Atomic Energy Commission, the Remote Sensing Center, the Scientific Research Academy, the Meteorological Administration and the Earthquake Institute in Hulwan. All these [agencies] agreed on al-Dab'ah as the best location that meets all human and environmental nuclear saftey rules and regulations and world standards for the operation of nuclear energy plants set by the IAEA in Vienna, the American Nuclear Regulatory Commission and valid French rules and regulations.

12502
CSO: 5100/4606

BRIEFS

URANIUM ENRICHMENT CAPABILITY--India can enrich uranium to whatever level it requires, according to the chairman of the Atomic Energy Commission, Dr Raja Ramanna. He said the Bhabha Atomic Research Centre (Barc) was already enriching uranium on a pilot scale, and it could be produced any time "the country required". Asked about the level of enrichment possible, he said: "This does not matter. It only depends on the number of units added." This statement, made during a press conference on 4 November, is the first time India's enrichment capability has been officially acknowledged, though it was known that an experimental centrifuge facility had been in operation for some time at Barc. Barc director, Dr P.K. Iyengar said they were also developing laser enrichment techniques. India has only two reactors which require enriched fuel, the US-built BWRS at Tarapur, for which fuel is presently imported from France. Under an agreement with the US, India must obtain American permission to operate Tarapur with home-enriched fuel. Commenting on recent reports that Pakistan had acquired an enrichment capability, Dr Ramanna said he did not know if all its centrifuge units were working, but that if they were the Pakistanis would be able to produce bomb grade material. Dr Ramanna said that all the heavy water for the Madras plants "came from our own factories". He denied reports that it had come from China. [Text] [Surrey NUCLEAR ENGINEERING INTERNATIONAL Jan 87 p 8] /13046

CSO: 5100/4717

BRIEFS

VANUNU LEAKS CAUSED SECURITY DAMAGE--The state has for the first time admitted that the information provided by Mordekhay Vanunu about Israel's alleged nuclear secrets to THE SUNDAY TIMES of London caused serious damage to national security. This was revealed yesterday in an affidavit submitted by the state to the Jerusalem District Court. The affidavit was filed in response to Vanunu's petition asking the court to order the prison authorities to allow him to meet face to face with his girlfriend Judy Zimmet. The affidavit also stated that Vanunu had twice passed secret information since his arrest: once to members of his family when they visited him in jail, and another time when he flashed a message on his palm to reporters. [ITIM report] [Excerpt] [Jerusalem THE JERUSALEM POST in English 30 Jan 87 p 2 TA] /6091

NORWAY: NO EVIDENCE OF NUCLEAR WEAPONS--Norway says that it has checked and found no information to confirm Israel's possession of nuclear weapons. The Norwegian Government's foreign minister, Knut Frydenlund, said that his government examined the use Israel had made of the heavy water Norway sold Israel more than 20 years ago and could find no evidence that Israel used the water to manufacture nuclear weapons. Reporters in Oslo point out that the consignment of heavy water to Israel was made following the signing of a secret agreement between Israel and Norway that stipulated that the water would be used exclusively for peaceful purposes. The accord stated that Norway would be permitted to check into whether Israel was abiding by this agreement at any time it so desired. [Text] [Jerusalem Domestic Service in Hebrew 2100 GMT 4 Feb 87 TA] /6091

CSO: 5100/4516

LAW PASSED REGARDING USE OF NUCLEAR TECHNOLOGY

Amman JORDAN TIMES in English 4 Feb 87 p 3

[Article by Rana Sabbagh]

[Excerpt] Under the new law, unanimously endorsed by the Lower House of Parliament, an 11-member technical committee for nuclear energy consultation will be formed to suggest policies, plans and legislation to develop the use of nuclear technology and science in Jordan.

The committee, to be chaired by the minister of energy and mineral resources, will be entrusted with formulating a general policy on training personnel working with nuclear power and devising measures to protect them against possible radiation dangers. It will also coordinate efforts between Jordan and other international bodies in areas related to the use of nuclear power and technology, as well as the exchange of expertise. The new law aims at protecting the environment from ionized X-rays and to prevent both operators of nuclear machinery and the citizens from possible danger.

The law, observers said, came in response to the numerous uses of nuclear energy in various local sectors. Local reports recently said the Royal Scientific Society (RSS) has plans to set up a regional network for monitoring radioactivity. Hospitals are using radiotherapy treatment for cancer patients and other cases. Nuclear accelerator machine was also recently installed at Al Bashir Hospital for cancer treatment. Limited research on nuclear power is also being conducted at the local universities whilst nuclear energy is also being used in a few local industries.

The evidence of Uranium deposits in Jordan and its future exploitation was also cited as another reason prompting the issuance of the law.

A seven-member panel will be set up under the presidency of the under secretary at the Ministry of Energy and Mineral Resources to suggest protection measures related to its function.

The law was passed after deputies rejected suggestions made by their colleague Dr. Riyadh Al Nawaiseh to modify a number of its articles.

Although the new law banned people under 16 from being employed or trained in radiology or in other related fields, Dr. Nawaiseh suggested the age ceiling to be put at 18, saying that physical maturity is complete at the age of 18. However, Health Minister Zaid Hamzeh rejected his proposal charging that the average age of students attending community college courses for assistant radiologists was normally between 16 and 18 years of age.

Applications in medicine

Dr. Nawaiseh also proposed omitting an article which said that no medical authority is allowed to use radiation therapy unless complete success can be guaranteed.

The Karak deputy, who is a general practitioner, said dangers imposed on patients from surgeries and medications were equal to those of radiotherapy and therefore such an article was not needed since doctors are more aware of what the best treatment, whatever its measure of success.

Commenting on another article which calls for protecting pregnant women against radiation and in cases for urgent radiotherapy treatment for pregnant women or women whose pregnancy is suspected, Dr. Nawaiseh called for stricter measures to ensure the patient's complete safety.

Salary allowance

Although the law stipulated that personnel working in radiology or nuclear energy-related activities should be given a 30 per cent allowance on their basic salary, Dr. Nawaiseh suggested that a code should be added to guarantee that these personnel get their salary plus the 30 per cent increment upon their retirement.

Other articles included in the law banned issuing licences for radioactivity purposes unless the user is fully-qualified to do so and one article gave the health minister full rights to nullify any licences for radioactivity fields, or freeze the licence in case violations are committed by the operator.

The legislation gave nuclear power operators a maximum period of 24-hours to report to the police in case any nuclear accident or leak takes place.

Violators of the law's articles will be fined between JD 5,000 to JD 15,000, and or imprisoned for a minimum of one to three years.

During Tuesday's session, the House referred to the government a suggestion presented by 28 deputies on amending an article in the law of the Jordan Medical Association calling for the revocability of decisions taken by the association's disciplinary council. The present article states that decisions taken by the council are irrevocable. Prime Minister Zaid Rifai told the House that the government was in favour of the deputies' demand over the article and said it supported the revocability of all administrative decisions taken by the association's disciplinary council.

/13104
CSO: 5100/4517

PAKISTAN SAID THIRD WORLD LEADER IN NUCLEAR ENERGY

Lahore THE PAKISTAN TIMES in English 3 Feb 87 Commerce Supplement p iv

[Excerpts]

ISLAMABAD, Feb 2: Pakistan is the leading country in the Third World as well as in Muslim countries in the generation of nuclear energy, Minister of State for Foreign Affairs, Mr. Zain Noorani informed the Senate today.

Replying to supplementary question asked by Syed Abbas Shah during the question hour, the Minister explained that Pakistan Atomic Energy Commission (PAEC) had been successful in achieving its objectives in nuclear technology for peaceful purposes.

The Commission, he said had successfully undertaken its assigned tasks in different fields including agriculture, industry and medicine. About the working of PAEC, the Minister said that it was divided into two parts including general and classified working. The classified working of Commission, he added, could not be divulged in the House.

Despite the embargo from Canada on supply of part, the Pakistani scientists were capable to operate KANNUP of the Government for energy in Karachi. In written answer, Mr. Zain Noorani said that PAEC had been eminently successful in implementing its assigned tasks. The commission, he added, makes effective use of all the equipments and instruments it purchases and keeps them in good running order.

Mr. Zain Noorani further informed the House that PAEC did not have any plasma plants. The Commission has a few instruments of inductivity-coupled plasma spectometers used for precise analysis of different materials, which were for use in different laboratories around the country, so that analysis of nuclear and other materials can be carried out at the site without delay and in keeping with safety requirements. The price of the plasma spectometers ranges from Rs. 22 to 28 lakh, depending upon the size, time and country of purchase. Each instrument was being used for analysing thousands of samples per year.

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CSO: 5100/4719

SPOKESMAN AFFIRMS PEACEFUL NUCLEAR PROGRAM

BK111625 Karachi Domestic Service in Urdu 1500 GMT 11 Feb 87

[Text] A Foreign Office spokesman said in Islamabad today that Pakistan's nuclear program is of a peaceful nature and this fact has been proved during the last 6 or 7 years. Pakistan has not carried out any nuclear explosion, nor does it have any such intention.

The spokesman said that Pakistan understands there will be no string attached to the 1987-93 U.S. package aid agreement. This agreement will be presented to the U.S. Congress by the end of this month.

In reply to a question, the spokesman refuted reports that France is now ready to fulfill its commitment to set up a reprocessing plant. The spokesman said that Pakistan and France have held dialogue on paying compensation for violating the agreement to install a reprocessing plant in Pakistan. But there has been no progress in this regard.

Pakistan is in touch with more than 100 countries which have set up nuclear reactors for power generation, and it is ready to accept the control and safeguards of the International Atomic Energy Agency.

In reply to another question, the spokesman said that Pakistan has not invited the Afghan refugees, nor is it preventing anyone from returning home. This is merely propaganda against Pakistan which has been rejected by the entire world.

/8309
CSO: 5100/4718

QUESTIONS ANSWERED ON KOEBERG'S RADIATION POTENTIAL

Cape Town DIE BURGER in Afrikaans 5 Jan 87 p 14

[Question and answer column: "Koeberg's Radioactive Gasses Continually Analyzed"]

[Text] Phillip van der Merwe, Martinson Street 10, Stellenbosch, writes:
I refer to the answer of Mr Andre van Heerden of Escom (Opinions, 13 October 1986) about Koeberg, and would like to know from him:
1. How long are radioactive gasses stored at Koeberg's two reactors before they are released into the atmposphere?
2. How high above the surface of the ground are they released?
3. What method of storage (or delayed release) is used?
4. Is an epidemiological study being done to determine whether certain kinds of cancer are increasing as a result of Koeberg?

Answer

Brian Oaten, manager, Koeberg Power Station, answers:
All releases of radioactive gasses are strictly controlled by Escom and the licensing branch of the Atomic Energy Corporation (AEC). All releases of radioactive material are thoroughly monitored and documented in order for Escom to retain the license to operate Koeberg. All data are then sent to the AEC for careful examination. In order to answer Mr Van der Merwe's question meaninfully, I am giving a short description of the treatment process for radioactive gasses. Gasses which are released at Koeberg and which contain hydrogen are treated so that the hydrogen is recombined with oxygen. The process is also further determined by the flow rate of the gasses and how regularly the gasses must be treated.

Storage Tanks

The process of delayed release is used for the gasses which regularly originate with low flow rate. Charcoal adsorbers are used in this process. The gasses are filtered and diluted before analyses of the radioactivity is made. Only then are the gasses released into the atmosphere through the ventilation funnel which is about 60 meters above the ground surface. With gasses of high flow rate, which occur rarely, use is made of storage tanks. These contain 18 cubic meters of gas which is stored at 6.5 times atmospheric

pressure. The radioactivity of the gasses diminishes considerably in the period the gasses are stored. Samples of the gasses are taken and thorough analyses made before release through the ventilation funnel. Between one and two storage tanks a month will be released only if they are within prescribed limits.

Program

As for Mr Van der Merwe's last question, I must stress that there is an extensive program in action checking Koeberg's influence on the environment. The program was already started three years before Koeberg was commissioned in order to determine the natural background radioactivity. Results of this environmental test are submitted regularly to the AEC. There is also regular liaison with the International Atomic Energy Agency about the program. This environmental test program will be maintained for as long as Koeberg is in existence. No noteworthy increase in background radioactivity has thus far been observed.

13084
CSO: 5100/22

PAKSH AES UNIT NO 3 GOES ON STREAM

Moscow KOMSOMOLSKAYA PRAVDA in Russian 26 Dec 86 p 3

[Article by A. Kaverznev, staff correspondent, under the "Borders of Integration" rubric: "Energy of Cooperation"; first paragraph is source introduction]

[Text] At the Paksh AES the third unit has been put on stream. This event was reported on the front pages of Hungarian newspapers. Deputy General Secretary of the Hungarian Socialist Workers Party (VSRP) Karoy Nemet appeared at a mass meeting celebrating the turning over of the unit. He presented Hungarian government awards to workers who had distinguished themselves on the construction of the unit, the installation of equipment and preparation of the unit for operation. This is the significance assigned to the Paksh AES in Hungary.

I do not want to weary the reader with an abundance of numbers, but numbers give the fullest representation of the importance of Paksh to the Hungarian economy. It is vitally important. After the fourth unit goes on stream at the end of 1987, the AES will produce about 13 billion kilowatt-hours per year--about half the country's total energy production.

With good reason, specialists consider the Paksh AES one of the "cleanest" and safest plants in the world. According to its operating indicators, the Hungarian AES is among the best of this type in the world. It achieved these indicators because of the high technological level and quality of its equipment, and also because of the experience accumulated by the Hungarian specialists. More than 500 of them received training in Soviet training centers, and about 30 of them received their higher education in our country.

A collective of more than a hundred Soviet specialists also works at Paksh. They are helping their Hungarian colleagues install equipment and are supervising the work during the station's construction. They also are taking part in the unit's operational activities.

Doesn't Hungary have enough of its own engineers and workers? That is not the point. The Paksh AES was the first project to be constructed on the basis of multi-faceted cooperation among the Socialist countries. In 1979 they signed

an agreement concerning specialization and organization in the production of complex technological equipment for nuclear power plants. With the assistance of Soviet organizations and in accordance with technical documentation prepared in the USSR, the production of the most modern equipment was begun in those countries. Soviet specialists executed the technical and working designs for the Paksh AES as well as the organizational schemes for construction and installation work.

Because of the cooperation with our country, an essentially new industrial sector-nuclear power engineering--was established in Hungary. The production of complex AES equipment, which is not only used at Paksh, but is exported to other countries, including the Soviet Union, was established.

It really does not seem that long ago when all this started... The 9th Congress of the Hungarian Communist Youth Union [UKSM], which took place in May 1976, proclaimed the Paksh AES a Komsomol project. The grandiose project was being developed in a sparsely populated--by Hungarian standards--region of the country and not only qualified specialists were required, but, first of all, bulldozer operators, excavator operators, and concrete workers were needed for work on the "zero cycle." The country asked the Komsomol for help and hundreds of young volunteers, responding to the call, traveled to Paksh. At the same time, the Komsomol looked after the supply of materials and equipment for the AES.

As the first units were completed, the working conditions changed at the station. The tasks of the Komsomol organization also changed.

Yanosh Berko, the VKSM committee secretary for the Paksh AES, considers that even the best forms of Komsomol work gradually grow obsolete. Yanosh, an engineer by profession, worked a year as a mechanic at the AES, and now has already worked three years as the station Komsomol head while at the same time being a member of the oblast VKSM committee.

"Now that the intensive station operations stage is beginning, the activity of the Komsomol must also become intensive", he says. "We must search out new ways to interest the young specialists in productive, creative work. It is necessary to establish the conditions so that each can demonstrate initiative, demonstrate all of his abilities."

The young engineers are up to the solution of complex problems. A group of specialists worked out an original scheme for transporting nuclear fuel to the station--simpler and safer in comparison to the traditional way. Young engineers from the nuclear safety division proposed a new method for predicting the reactor's fuel reserve.

Professional competitions are held regularly at the AES. Both Soviet and Polish specialists participate in them with their Hungarian friends. As a matter of fact, they are always together--in the workplace, as well as on the soccer field and on excursions. The Paksh AES is an international project.

Construction will not end with the completion of the fourth and last unit, which has a generating capacity of 440 megawatts. Several months ago a Soviet-Hungarian agreement was signed concerning the equipping of two more units, each with a thousand megawatt generating capacity. It is possible that even these units will not be the end.

13111/9738
CSO: 5100/015

BACKGROUND OF NUCLEAR PROGRAM CHRONICLED

PM090905 Madrid EL PAIS in Spanish 1 Feb 87 (DOMINGO Supplement) pp 1-3

[Soledad Gallego-Diaz and Carlos Gomez report: "The Temptation of the Bomb"]

[Text] The Spanish Army has several feasibility and cost studies for the production of tactical nuclear weapons and for equipping our Navy with nuclear-powered submarines. These studies, "officially" denied by various governments, are secret.

Current Defense Minister Narciso Serra told the Congress [of Deputies] 12 March 1985: "We have inherited no development or study for producing nuclear weapons, nor will this government conduct any." This categorical denial of the legacy received contrasts with the existence of these studies confirmed by this newspaper. For instance, a 1971 secret study put the cost of a Spanish-made tactical nuclear bomb at 8.7 billion pesetas at that time (63 billion pesetas now).

During the past few days, a senior executive of the former Nuclear Energy Board (JEN) confessed: "If there were a political decision we would have a tactical nuclear bomb ready within 3 or 4 years at most, and not one of the most rudimentary bombs but one of the most modern ones. Having the means necessary to launch those bombs is another matter." The expert did not know or would not acknowledge that the Spanish Army already has self-propelled howitzers capable of carrying nuclear warheads and aircraft which with certain modifications can be turned into delivery vehicles.

The unconfessable dream of a national nuclear bomb arose almost the day after the attack on Hiroshima and Nagasaki. Under the auspices of two military men — Luis Carrero Blanco and Chief of Staff General Juan Vigon — a program was launched to acquire and master that technology.

The leading spirit of the research was Jose Maria Otero Navascues, a Navy engineer, who had won great scientific prestige in the early forties thanks to his work on night blindness. He was a real pioneer. Nuclear energy was regarded worldwide as a military top secret, and the Spanish regime was more isolated than ever. Otero succeeded in establishing contact with foreign scientists in order to be kept up to date in the basic and theoretical knowledge of nuclear physics.

Thanks to the work of that group of people, when President Eisenhower launched the "Atoms for Peace" program in 1955, Spain already had "reasonable" scientific knowledge. "The proof is that a U.S. commission which visited us that very year wrote in a report to the U.S. Senate that Spain was the fifth-ranking that time that the first detailed study concerning the manufacture of the Spanish nuclear bomb was prepared at the Higher Center of National Defense Studies (Ceseden).

According to this study, still classified as confidential, Spain could rapidly make its own nuclear weapons by using the plants which it already had. Vandellos' importance as a source of plutonium for military use was emphasized, although the possibility was suggested of building another, exclusively Spanish, small gas-graphite power plant to avert possible leaks and to become less dependent in the future on the French partner's collusive silence. The study suggests the Sahara as a suitable place to test the bomb (it must not be forgotten that France tested its first devices in the Sahara Desert in Algeria) and puts the cost at 8.7 billion pesetas.

A diplomat who held senior posts at the Foreign Ministry recalled that in 1975 the issue of nuclear weapons arose again in "informal" talks in the general staffs and that there was even a stormy meeting at which a general complained bitterly about the lack of nuclear-tipped shells and grenades. Franco's death throes and Morocco's "green march" on the Sahara exasperated several of the highest military chiefs, who had to be calmed down by their comrades. One of them indignantly went so far as to retort: "But what are you dreaming about? If you drop a nuclear bomb on Rabat, the contamination will reach us as far as the Ebro."

The enormous development in Spain of nuclear technology and plants for dual use, civilian and military, did not go unnoticed among the big powers. The comfortable situation in which Spain had operated until that time began to change in the years 1976-80, with Jimmy Carter's accession to the U.S. presidency. A CIA report which was drafted in October 1974 but became known in February 1977 asserted that a group of 6 countries including Spain could have their own nuclear weapons within 7 or 10 years.

"Carter embarked on a real campaign against nuclear proliferation and against the countries which had not signed the nonproliferation treaty," one of the top JEN officials explained. "India had exploded its bomb, and the big powers were very concerned about the lack of controls in some countries," he continued.

The United States reacted with a new law which banned the reprocessing of radioactive waste (a method to obtain plutonium and enriched uranium), barring the way to fast reactors (which produce plutonium), and threatening to restrict the supply of weakly enriched uranium for nuclear power plants unless all the recipient country's nuclear power plants were subject to control.

In the case of Spain, the U.S. Administration demanded IAEA control over five plant — Vandellos, the Coral fast reactor, the JEN reprocessing plant, and the Bilbao and Barcelona research reactors. The issue was so important for the United States that President Carter himself raised it with Adolfo Suarez during his first visit to Washington.

The first democratic government decided to continue to refuse to sign the Nonproliferation Treaty despite the pressures and to open negotiations with the Americans to find another solution. Suarez also believed Westinghouse and General Electric, which had interests in the Spanish nuclear power plants, would struggle to prevent the supply of fuel for them from being obstructed. "We proposed placing those five plants under the IAEA. The difference is very important, because we did not commit ourselves to anything in the future," one of the negotiators asserted.

The U.S. pressure (there were already some delays in the delivery of enriched uranium at the end of 1980) was resolved with the signing of an agreement 1 April 1980, whereby control on the above-mentioned terms was accepted.

One of the most confused stories of this period is the plan to build a second JEN center in Soria. Some officials of the board, with the approval of the Industry and Defense Ministries, began to study the possibility of setting up better equipped new facilities outside Madrid in the years 1970-73.

That center represented the culmination of the line followed by nuclear research with its dual civilian and military aspects. It was estimated that some 17 billion pesetas would be spent and that over 1,500 people would come to work there. The list of facilities envisaged was impressive — a new enriched uranium reactor for research, another fast reactor, facilities for making fuel elements for those reactors, a pilot reprocessing plant, and a plutonium laboratory, among others.

The site was fenced off and prepared, a fine network of roads and some buildings were built...and nothing more. The place is now a wood processing plant. What happened between the original approval of the project in 1976 and its subsequent abandonment? The official explanation is that it was soon realized the nuclear power plant program in Spain was exorbitant and that it would have to be drastically reduced.

"Under those conditions it was no longer worthwhile to bring into operation something as excessive as Soria," a former minister of industry asserted. "The fact is that the idea of the Soria center arose at a bad time," asserted someone who was one of its greatest champions. It was a very bad time because, as well as what has been said, several of the future JEN II facilities came squarely under what the United States described as "undesirable plants." "No bomb was going to be made in Soria," asserted the same source, who complained that successive ministers of defense and industry did not silence the rumors vigorously enough.

Spain, which has the plants, the fuel, and the plans to make nuclear weapons, thus became a suspect country. The international mistrust stems from an indisputable fact — the refusal to sign the Nonproliferation Treaty, which came into force in 1970 and is one of the treaties which the greatest number of countries have endorsed.

No Spanish Government, including the Socialist government currently in power, has clearly ruled out the possibility that this kind of weapon may be made here some day. This ambiguity explains why several international bodies believed at the beginning of the seventies that one of the aims of our defense policy was to make a tactical nuclear bomb operational between 1979 and 1980. The bomb has not been made, but the path remains open, as several Union of the Democratic Center ministers have acknowledged.

/9274
CSO: 5100/2426

NUCLEAR FUEL PILOT FACILITY OPENED

Cekmece Research, Training Center

Istanbul CUMHURIYET in Turkish 31 Oct 86, pp 1, 8

[Text] Turkey's first 'nuclear fuel pilot facility' was opened in Istanbul yesterday by Minister of Industry and Commerce Cahit Aral. The facility, opened yesterday with a ceremony at Cekmece Nuclear Research and Training Center (CNRTC), will be producing fuel for nuclear reactors. Costing TL 285 million, the facility was completed in 18 months, over 20 Turkish engineers working on the project. It is expected that cheaper and better quality nuclear fuel will be produced at the facility.

At CNRTC nuclear research is continuing full sway. According to officials, quite soon a 'radiation early warning system' will be established -- a network of 40 stations at different locations around the country. In this way, an imminent danger of radiation will be relayed to the public and required measures will be taken beforehand.

After opening the facility, Minister Cahit Aral toured the Center as well as giving technical information. Pointing out that the Chernobyl incident had brought a whole new perspective to the question of nuclear energy, Aral said: "The incident caused our work to be suspended for a while but we will be starting soon." Referring to the issue of 'radioactive hazelnuts', Aral noted:

This Center is expected to handle research on 10,000 different kind of hazelnuts. Yes, hazelnuts have been affected by radiation but it is still lower than the level specified by World Health Organization. To a question concerning Israel's "speeding up its nuclear program in recent years" and whether this might indicate Israel's "intention to become a leader in this field" in the Middle East, Aral responded, "Israel is far ahead of us in the nuclear field." He added: "We don't really know what Israel's intentions are. As in all other matters we are

sensitive to the nuclear issue, monitoring the developments quite closely."

Aral toured various parts of the facility -- the nuclear reactor, section where tecnisium (which is used in medicine) is obtained, and the unit where uranium mining areas will be determined. Aral remarked: "An important mineral uranium... By and large it is known which areas of Turkey contain uranium deposits. Naturally, work in this field is proceeding in secret."

Production Figures

Istanbul CUMHURIYET in Turkish 31 Oct 86, pp 1, 8

[Text] In facilities producing nuclear fuel, what is really being produced are uranium dioxide fuel rods which provide the energy used in nuclear reactors. These rods usually have a dark, smoky color, and they are no bigger than a joint of the index finger. Before they are ready for use these rods are placed into fuel pipes made of zirkonium (a metal used in nuclear reactors).

The nuclear fuel pilot facility at Cekmece Nuclear Research and Training Center (CNRTC) is designed to constitute a model for future nuclear fuel facilities in Turkey.

The raw material used at nuclear facilities is usually an uranium concentrate in the form of 'yellow paste'. This 'yellow paste' undergoes a process of purification and turns into uranium dioxide. Originally in powder form, this chemical is put into a press and squeezed into rods which are then subjected to a process of further compression. Without this latter process it would be impossible to use uranium dioxide as fuel.

The CNRTC nuclear fuel pilot facility will be mostly geared to research and play the part of 'role model' for facilities expected to be set up in the future. The current director of the facility Dr. Resat Uzmen says, "Our facility will be producing around 1 million uranium dioxide rods annually. If 2,000 megawatt nuclear reactors are built in the future, we would need to produce 100 tons of rods." Uzmen also underlined the point that those working at the facility will not be under any danger of radiation.

12466
CSO: 5100/2416

AEC ANNOUNCES APPROPRIATIONS FOR RADIATION ALERT SYSTEM

Istanbul MILLIYET in Turkish 22 Oct 86 p 19

[Text] In the wake of Chernobyl, Turkey has started to take the necessary measures regarding radiation, even if it is rather late in the day. "The explosion at Chernobyl has been an awakener and a warning slap in the face for us," said the Director of Atomic Energy Commission Professor Ahmet Yuksel Emre announcing that "the government has earmarked close to TL 1 billion for this purpose." The money will go to setting up 40 monitoring stations to measure radiation in our foods and in the natural environment as well as detecting radiation clouds that may come our way (Radiation Early Warning Stations). It will also fund 6 'nuclear analysis and research laboratories' at 6 different universities. The stations and laboratories are expected to be in service within the next 6 months.

In a statement made to HURRIYET yesterday, Professor Ozemre said:

The envisioned stations (40 of them) will be measuring the level and proportion of radiation automatically, and will help draw the nutritional map of Turkey by measuring radiation in foods and their copper and zinc content in various parts of the country. The universities where nuclear energy laboratories will be set up are: Black Sea, Thrace, Aegean, Cukurova, Uludag and Eastern Mediterranean Universities.

According to Ozemre, the Black Sea provinces, and the Mediterranean and Thrace regions will be monitored more closely in the future. Technical aid has been secured for this purpose from State Planning Organization and International Atomic Energy Agency.

Ozemre provided the following information regarding the stations and laboratories:

The early warning network to be established in 40 locations is designed to measure radiation levels automatically. When the

level reaches twice the norm an optic and acoustic alarm system will activate itself. I will be in a position to be notified of the alarm in a matter of 3 minutes after the bells start ringing. We will be taking the necessary measures immediately. We will issue advisories to citizens in matters relating to eating, drinking, going outdoors and so on. In Black Sea provinces, which lie immediately south of an area containing 15 Chernobyl-type reactors, more of these stations will be set up. Furthermore, regions and places like Mediterranean and Sivrihisar, with significant deposits of uranium and torium beneath the soil, will receive particular attention in this regard.

Professor Ozemre also announced plans to establish 'environmental radiology research centers' at Black Sea University and Eastern Mediterranean University in Cyprus. These will engage in environmental research with a radiation focus. The nuclear analysis laboratories -- which will be set up at Uludag, Thrace, Aegean and Cukurova Universities -- will be monitoring the radiation content of foods in their vicinity, also measuring copper, zinc and other 'residual elements' which, in certain dosages, are known to lead to various ailments. Ozemre added, "Thus, a nutritional map will emerge out of all this which will aid us in taking the necessary measures."

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